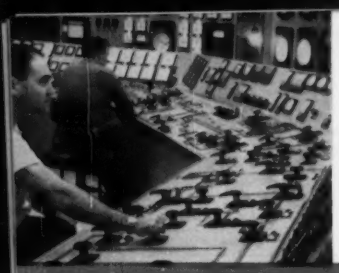


American Power Conference
. . . page 119

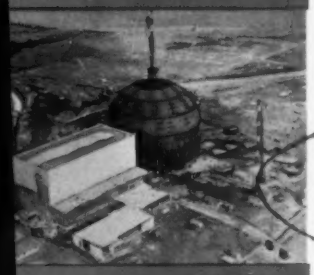
The Electrical Industry's Weekly Magazine

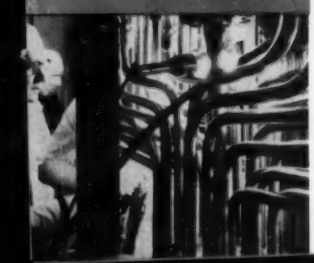
April 28, 1958

Electrical World

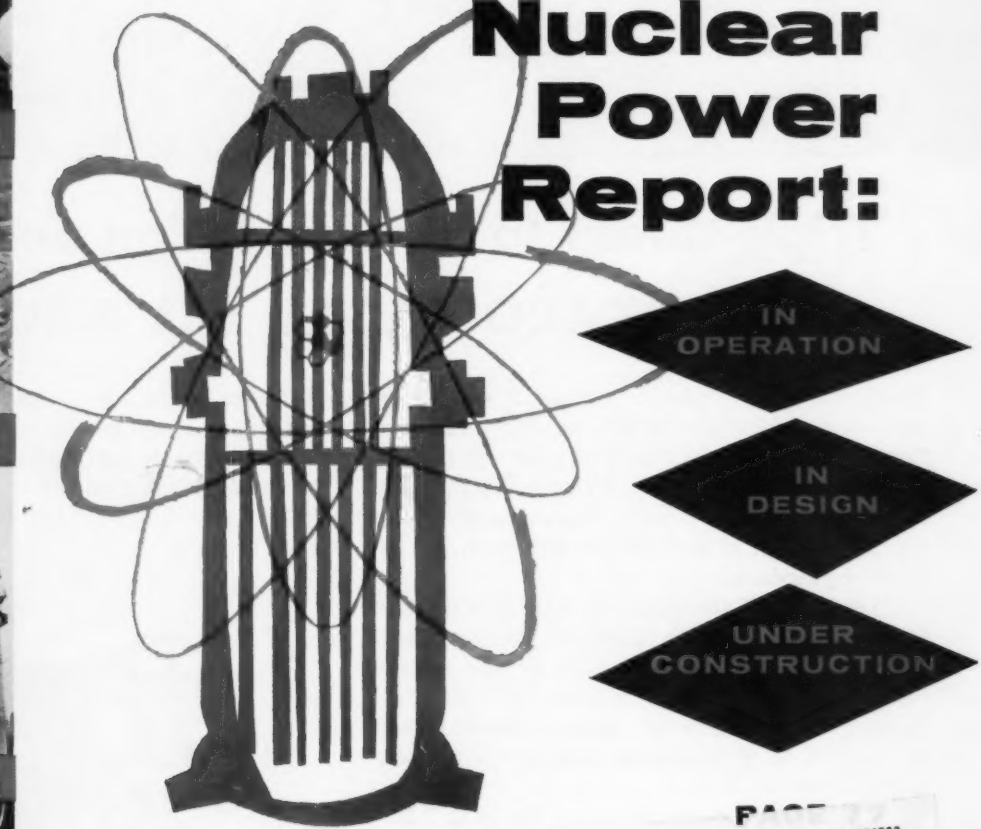
Price 50 Cents

A McGraw-Hill Publication





3rd Annual Nuclear Power Report:



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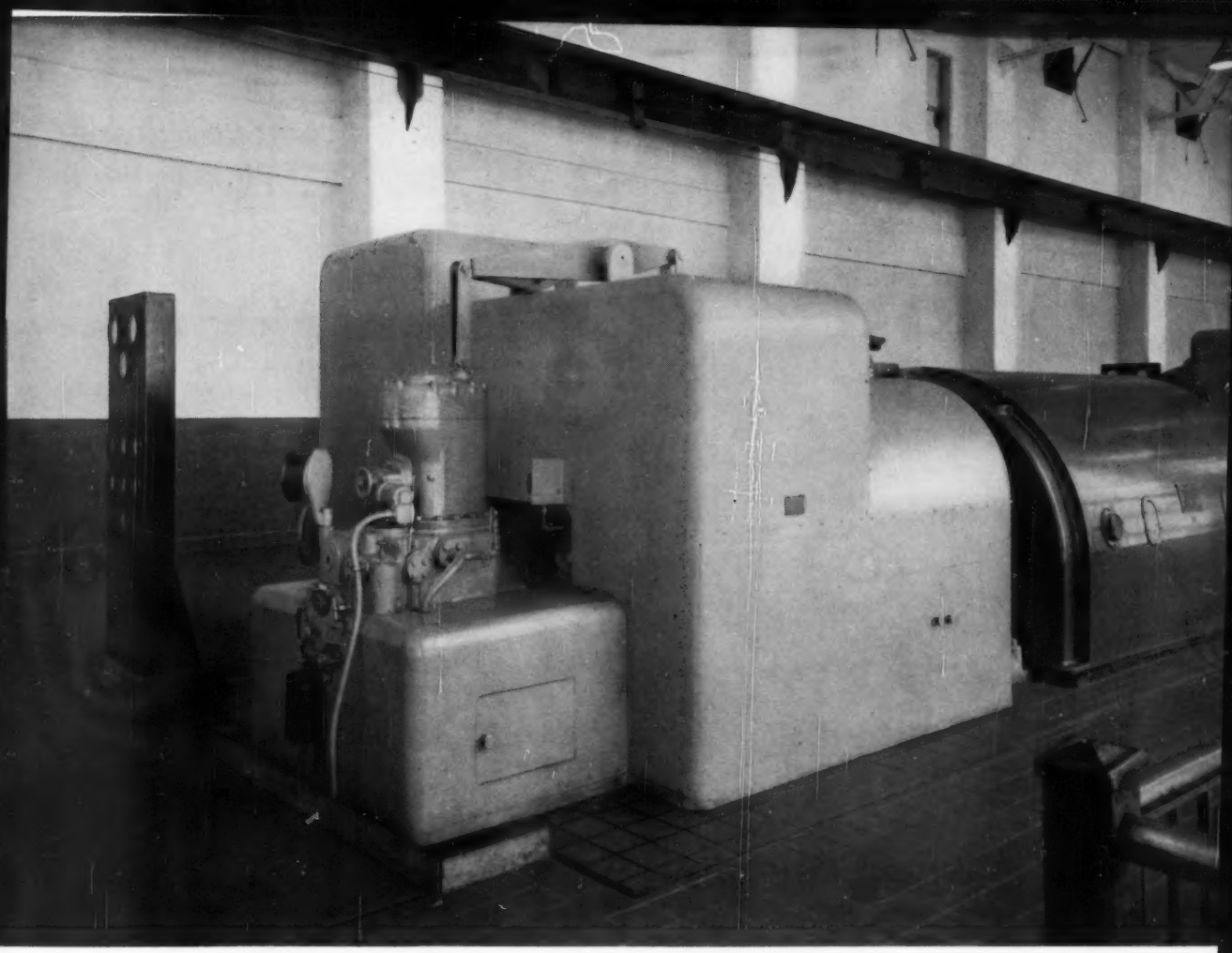

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Here's an oil that "takes care of itself"—and your turbine—by resisting oxidation, preventing rust and foam. Texaco Regal Oil R&O keeps bearings running cool and smooth, keeps the governor accurate and responsive, keeps maintenance costs down—because it resists the effects of entrained air and water, has an extra-long service life.

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LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

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Electrical World

Vol. 149, No. 17 APRIL 28, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

MEETING REPORTS

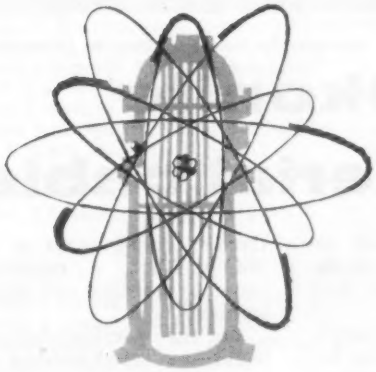
Tips from American Power Conference

Three-day meet gives specialists in power system generation, transmission, and distribution chance to parade proof of American engineering ingenuity. 119

Give Higher Secondary Voltage a Tryout

That was plea of top speaker at PCEA engineering and operating meeting. Nuclear power, reliability covered....p 91

Special Report



Third Annual Nuclear Power Report

Atomic power generation is entering a new era. Here, for the first time in a single package, is a roundup of preliminary operating information from five nuclear power reactors in the United States. And to round out the report and keep you up to date on all nuclear power projects there are 6 pages of tables detailing vital statistics and current status of all projects.....p 77

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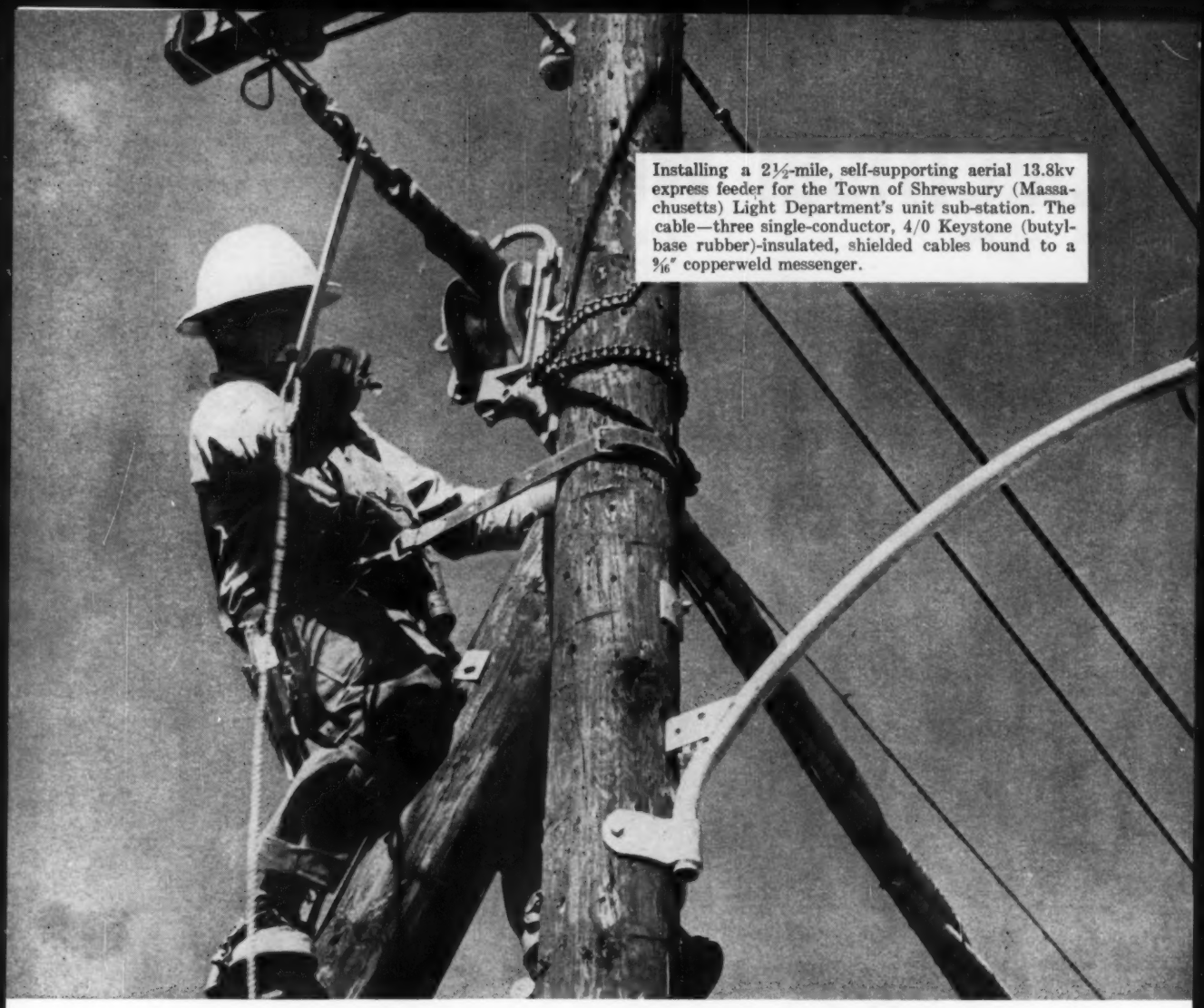

Installing a 2½-mile, self-supporting aerial 13.8kv express feeder for the Town of Shrewsbury (Massachusetts) Light Department's unit sub-station. The cable—three single-conductor, 4/0 Keystone (butyl-base rubber)-insulated, shielded cables bound to a 9/16" copperweld messenger.

Contractor: The Theodore D. Bross Line Construction Company

Modernize with Okonite self-supporting aerial cable...

The Town of Shrewsbury Light Department did just this when they recently installed a 13.8kv express feeder. They chose an Okonite self-supporting aerial cable because they wanted a superior installation that would practically eliminate tree trimming costs . . . be more reliable in storms (operate even with poles down) . . . reduce pole congestion . . . assure fewer interruptions or outages . . . have a moderate cost . . . provide improved voltage regulation because of lower reactance . . . and be more economical to operate and maintain than equivalent open wire lines.

In choosing Keystone (butyl-base rubber)-insulated cables for this important feeder, Shrewsbury Light Department was also banking on high voltage cable with a record for long and dependable service . . . high resistance to ozone and corona cutting . . . ability to take sharp bends . . . stable operation at copper conductor temperatures as high as 85C at 15kv . . . excellent resistance to moisture and extremes of temperatures.

For the complete story on Keystone-insulated cables, contact your Okonite representative . . . or write for Bulletin EW-463 where the results of field service and tests are reported with graphs and charts together with 36 pages of technical data.

The Okonite Company, Passaic, New Jersey.

where there's electrical power . . . there's **OKONITE CABLE**

4912

A Letter From a Senior Subscriber

ROY STOTT

Roy Stott, who has served since 1911 as manager of the Greenwood Utilities, Greenwood, Miss., will be retiring from active duty July 1. There is something very special about Mr. Stott as far as we are concerned. He is one of that select group that has been buying and reading Electrical World for over half a century—since 1904 according to his reckoning.

In a recent letter, Mr. Stott tells what he thinks of the magazine:

"Electrical World has meant a great deal to me over this span of years as a textbook, an industry news chronicle and a guide to the electric power industry. . . .

"Although not always agreeing with certain of your editorial policies, I can safely say that your publication has contributed immeasurably to the electric power industry and the small part I have played in it.

"It would be difficult to say what particular features of Electrical World I have enjoyed most over the years. Frankly, I have always looked forward to receiving each issue and reading it from cover to cover including the advertising."

We salute Mr. Stott on his retirement. We commend his remarks to all those engineers and junior executives entering the industry this year.

Fischer Black

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3-Phase POWER Regulators

Save 33% space...
30% cost...20% weight!

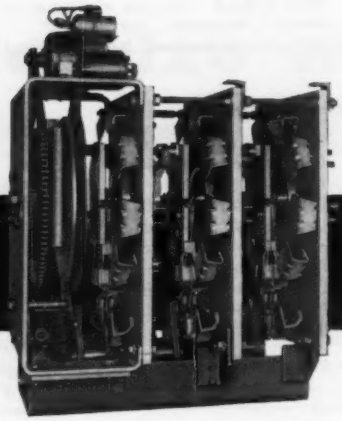
New design — new benefits to utilities are incorporated in the *NEW* Allis-Chalmers 3-phase power regulators.

- Now, substation space requirements for power regulators are reduced by at least one-third.
- Now, reduced sizes and weights for easier handling, lower installation cost.
- Now, cost per kva of 3-phase regulators is reduced 30%.
- Now, 600-amp maximum *Vari-Amp* rating is provided.

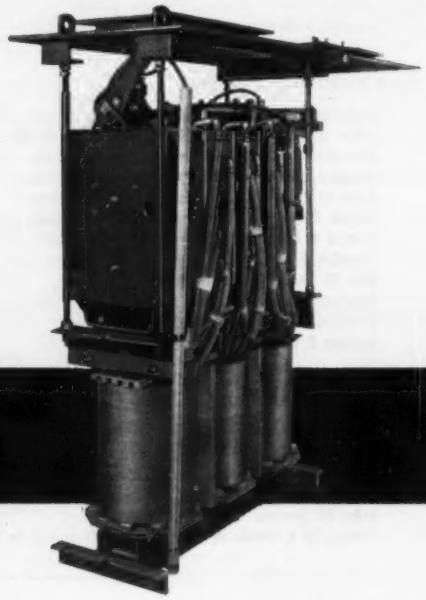
Available in most popular ratings

These new Allis-Chalmers power regulators are rated 500 and 750 kva, 8660 volts, and 500, 750 and 1000 kva, 13,200 volts.

These savings are so important it will pay you to re-evaluate your present substation planning on the basis of these new units. Check with your nearby A-C office or contact Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.



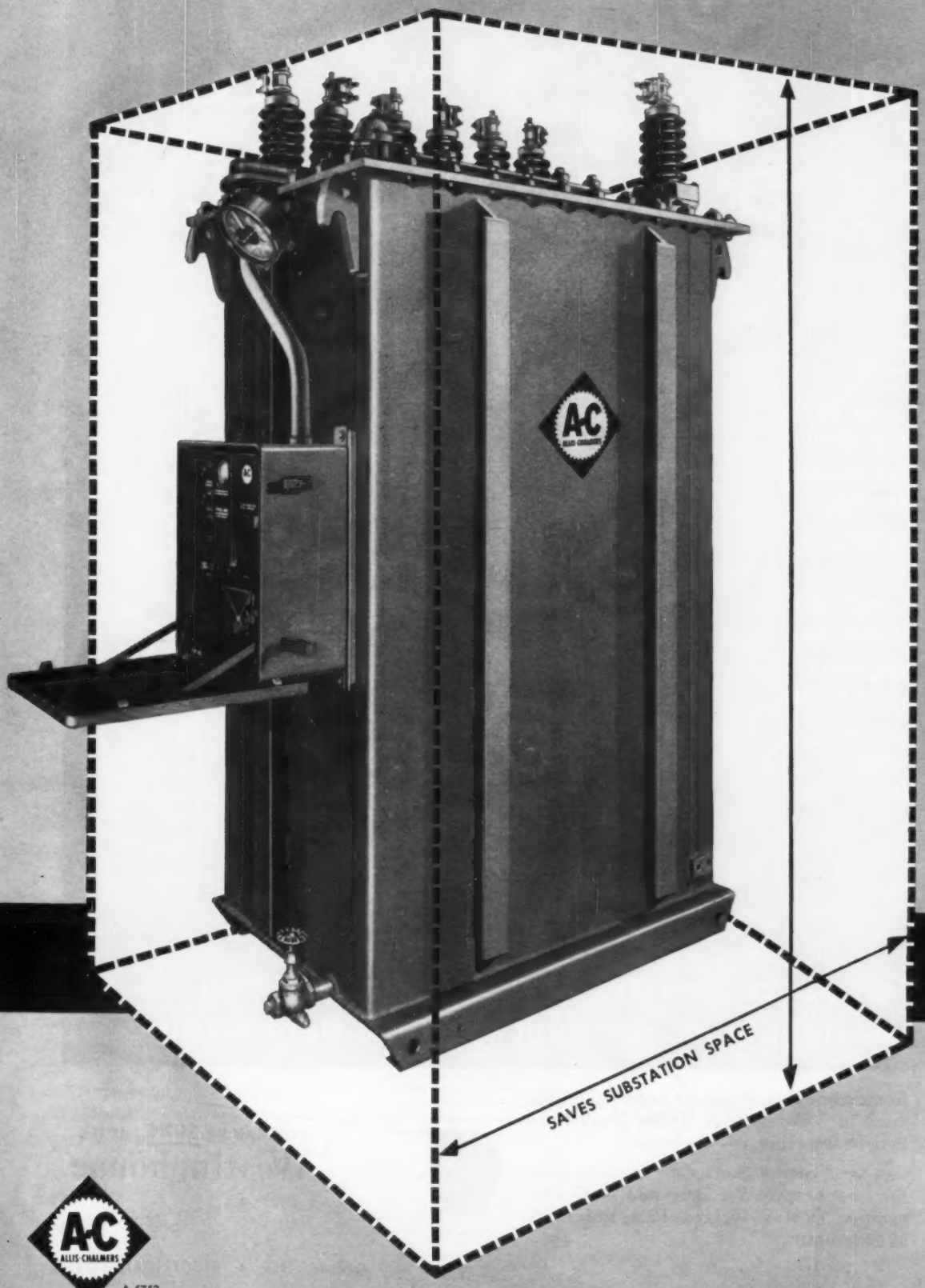
Heavy-duty tap-changing mechanism.



Unit construction combined with new space-saving arrangement of tap-changing mechanism.

ALLIS-CHALMERS

of Leadership in 5/8% Regulators



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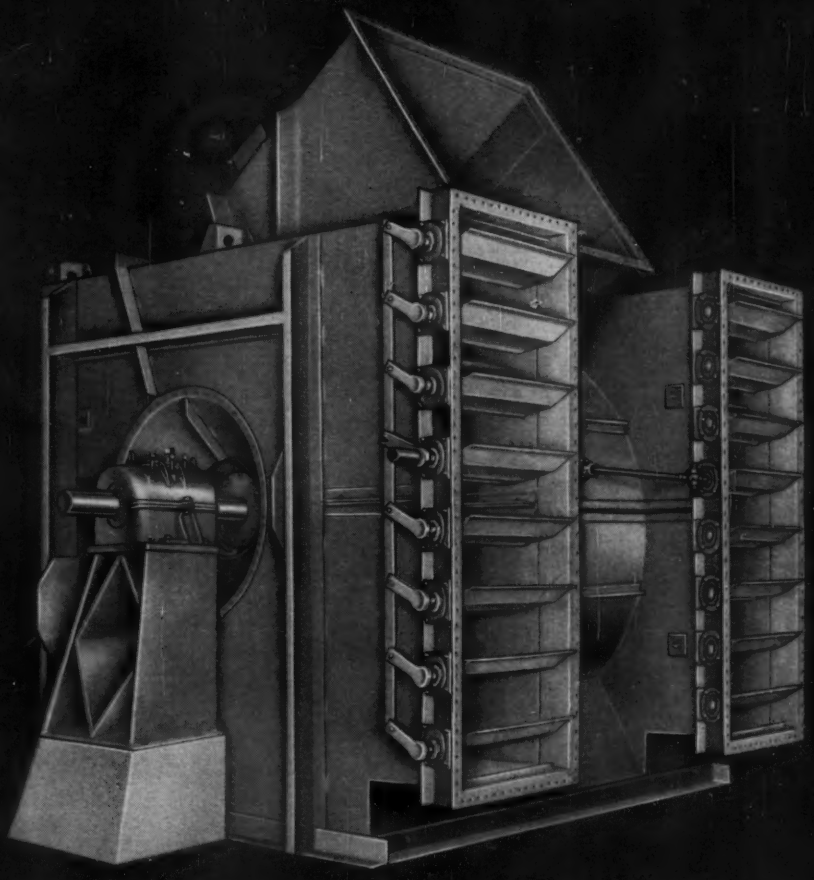

Westinghouse offers you a Heavy-Duty Fan... the right type...the right size...the right blading

Remember this: American Industry invests more in Westinghouse Heavy-Duty Fans than in any other.

Call your nearest Sturtevant Division Sales Engineer, or write Westinghouse Electric Corporation, Dept. D-16, Hyde Park, Boston 36, Massachusetts. J-80662

YOU CAN BE SURE...IF IT'S Westinghouse

Turbine spiral case being fabricated of USS "T-1" Steel in the shop of the S. Morgan Smith Co., York, Pa. Plates ranged in thickness from ½" to 1 5/16".

Taming the mighty Snake River with turbine spiral cases of USS "T-1" Steel

Stronger steel reduces weight . . . cuts costs

Four of these huge spiral cases are being built for the Idaho Power Company for use in the Brownlee Dam on the Snake River near Robinette, Oregon. They are designed for a 250-foot head of water. The inlet is 18 feet in diameter and each turbine will generate 144,000 horsepower at a speed of 128.6 rpm. Water will flow through the cases at a rate of 5,460 cubic feet per second.

Because of the fierce pressure, it was obvious that a strong steel was required. USS "T-1"* Steel was selected because it has a minimum yield strength of 90,000 psi. What's more, it can be fabricated, is readily weldable and has high resistance to impact abrasion.

Cost savings. By using USS* "T-1" Steel, there will be substantially less shipping weight across the country and less weld time and weld metal, both in the shop and on the job site. Had carbon steel been specified, double thicknesses would have been required.

Fabricating operations. Projection of the dimensional outline on the plates was done with Lumitrace. Plates were cut to size by flame-cutting and rolled cold to shape. Some parts were finish welded, others were tack welded and assembled. The spiral case was then disassembled and shipped. Finish welding of segments is to be done at the dam site.

This job points up the economies possible with the use of USS "T-1" Steel. Why not use it for your own equipment? Write for our "T-1" book containing complete information. United States Steel Corporation, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

Remember that we also make USS COR-TEN*, USS TRI-TEN* and USS MAN-TEN* Steels . . . widely used in power generation equipment.

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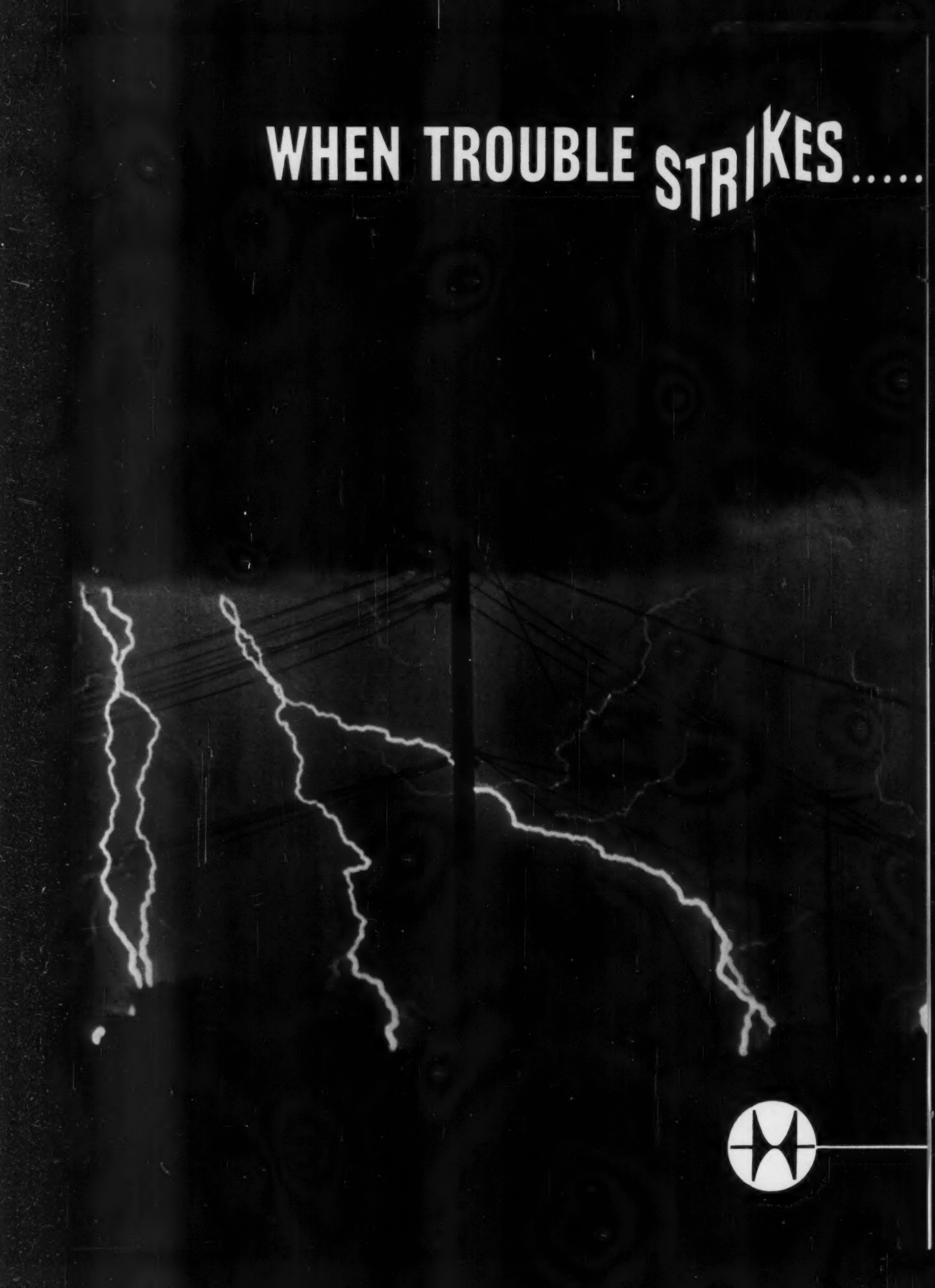
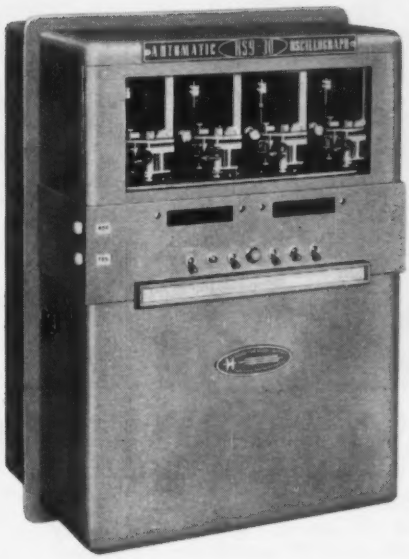
*TRADEMARK

WHEN TROUBLE STRIKES.....



....KNOW—*DON'T GUESS*—HOW YOUR PROTECTIVE SYSTEM OPERATED

with the HAMILTON RS-9 THIRTY AUTOMATIC OSCILLOGRAPH



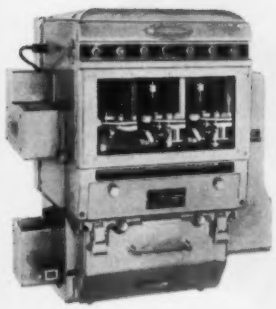
. . . provides proof of sequence of relay and breaker operation—a permanent, accurate record of what happens when a fault occurs.

The Hamilton Oscillograph, RS-9 Thirty, provides constant vigilance over your high voltage lines. It shows when a relay or breaker protecting the line is slow acting or erratic . . . often indicating faulty equipment before it can cause damage and costly down-time.

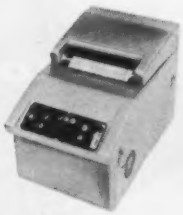
The RS-9 Thirty stands by, constantly monitoring your system. Then, within 2 milliseconds after a fault occurs, your Hamilton is automatically at work recording the transient wave forms for analysis, giving you a clear, easy-to-read record of everything that happens to your system for the duration of the fault. The RS-9 Thirty can also simplify fault location, and can be used for staged testing.

The RS-9 Thirty gives you these big advantages

- 32 Channels
- 2 millisecond automatic starting
- Sharp, easy-to-read trace records
- Fully automatic recording — resets itself for next fault
- Starting relays for all types of faults
- 12 inch chart—300 foot rolls thin base paper
- Fresh chart for every record
- Calibrated viewing screen
- Time and date of fault are recorded
- Automatic replacement of burned out lamps



A 14 channel oscillograph — the Hamilton RS-9 Fourteen — is also available.



The self-threading Hamilton SD-10 Automatic Record Developer gives you the results in minutes — no darkroom is needed.

There will be a demonstration of the RS-9 Thirty in your area soon.
To make sure that you are notified, check the coupon below.

Send for an actual chart recorded by an RS-9 Oscillograph.
See for yourself how easily the chart can be analyzed. See how sharp and easy-to-read the trace is. Just fill in this coupon, tear it off and mail it today.

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Gentlemen:
Please send me an actual chart recorded by an RS-9 Automatic Oscillograph, showing how easily I can determine faulty operation of the relays and breakers protecting my system.

☐ Let me know when the RS-9 Thirty demonstration is to be held in my area.

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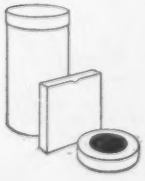
In 10-roll containers or single rolls • Each roll sealed in cellophane, stays fresh



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Gold Seal **FRICTION** *• Rubber • Plastic Tapes...Commercial and Specifications' Grades*

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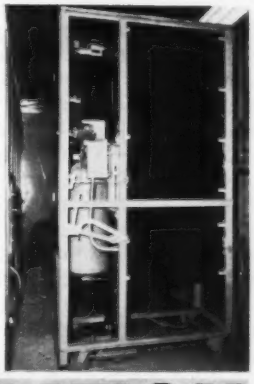
in outdoor walk-in enclosures

incorporates 25 YEARS of 1,000 MVA *OPERATING EXPERIENCE*

13.8 KV, 1200 Amp, 1000 MVA Draw-Out Switchgear in a large industrial plant. Note ample working area in the walk-in outdoor enclosure.

One of the removable 13.8 KV, 1200 Amp, 1000 MVA units in withdrawn position.



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Voltage Range: 13.8 KV through 34.5 KV* A.S.A. (*500 MVA at 5 KV)
Continuous Current Range: 800 Amps through 4,000 Amps.
Breaker Tripping Time: 2 or 3 cycles depending on voltage rating.
Basic Dimensions of a Typical 14.4 or 23 KV, 1000 MVA, 1200 Amp Cubicle: 39" wide x 90" deep x 122" high

THIS proven-in-use 1000 MVA draw-out switchgear has an unusual record for reliable performance and minimum maintenance. In electro-chemical plant installations as many as 100 operations at full interrupting capacity *without intermediate maintenance* have been reported. For furnace duty in the metallurgical industry up to 25,000 routine switching operations without intermediate maintenance have likewise been recorded.

The pre-fabricated, walk-in type of outdoor enclosure cuts construction costs by eliminating an expensive building to house this switchgear. Complete weather protection and ample aisle space is provided for the very infrequent maintenance required for this airblast switchgear.

Find out how you can adapt this equipment to your needs. Contact Brown Boveri Corporation, 19 Rector Street, New York 6, N. Y.

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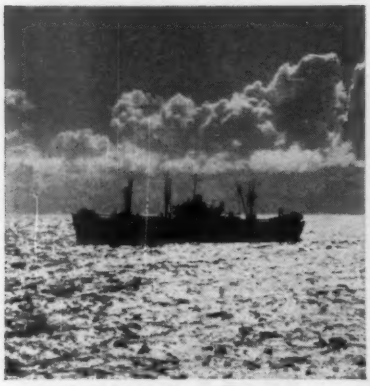
THE PEACEFUL ATOM

...can propel a ship one year without refueling

New Study Shows Nuclear Power May Be Practical and Economic for Merchant Ships

Some gray dawn in the early 1960's a heavily laden supertanker will shoulder her way through the steep Atlantic swells to a landfall in Delaware Bay. She'll be homeward bound for Philadelphia, 19 days out of Kuwait with nearly 40,000 tons of oil.



FOR SHIPS LIKE THIS...

No more dependent on thousands of tons of payload-stealing fuel oil, tomorrow's ships will range worldwide trade routes without refueling.

In the last twelve months she will have made eight trips to the Persian Gulf hand running. Now at last she is due for her annual refit... *and her annual refueling.*

Competitive at sea

A nuclear power plant for a ship of this type was the subject of a study recently completed by Atomics International for the Maritime Reactors Branch of the Atomic Energy Commission. Costs of building and operating a vessel powered by an Organic Moderated Reactor were compared with those for an oil-burning ship—a typical modern supertanker of some 38,000 deadweight tons.

Total costs for the OMR tanker, depreciated over 20 years, were only moderately higher than for today's conventional ship. But costs for oil-burners are on their way up, with steadily rising fuel prices seen from now on—whereas the cost trend for the OMR is downward, as nuclear technology is improved. An OMR tanker has greater cargo capacity because its fuel takes up little space. And it needs refueling less than once a year.

Bigger payloads, longer hauls, faster turn-arounds—this is the new pattern of operation. Shipowners can begin plans right now, for the Organic Moderated Reactor promises to put the atomic merchant ship on a sound commercial basis.

Versatile on land

The same features that make the OMR applicable for seagoing use are also in its favor for central power stations ashore. The basic simplicity and safety of this system point to economic nuclear electricity for many areas of the world today.

Plans are already underway to build an OMR plant in Piqua, Ohio, which will increase the city's electrical generating capacity by 12,500 kilowatts. Another OMR power station is planned for a Latin American country.

First OMR now in operation

All this stems from the results being achieved with the Organic Moderated Reactor Experiment, conducted by Atomics International for the Atomic Energy Commission. The Organic Moderated Reactor Experiment is being carried on at the AEC's National Reactor Testing Station in Idaho to establish the basic engineering data for this type plant. Atomics International is also operating the Sodium Reactor Experiment, a nuclear power project for the AEC. Another power reactor concept, the Advanced Epithermal Thorium Reactor, is under study for the Southwest Atomic Energy Associates. AI research reactors are now operating in Japan, Germany, Denmark, and the United States. Another is being built for Italy. ATOMICS INTERNATIONAL, P.O. Box 309, Canoga Park, Calif. Cable address: ATOMICS.

...ATOMIC ENGINES LIKE THIS

Al's Dr. A. B. Martin shows on this OMR tanker model how the compact power plant will free thousands of cubic feet of fuel space for revenue-producing cargo.

ATOMICS INTERNATIONAL

A DIVISION OF NORTH AMERICAN AVIATION, INC.

PIONEERS IN THE CREATIVE USE OF THE ATOM

FROM TOP TO BOTTOM, INSIDE AND OUT,

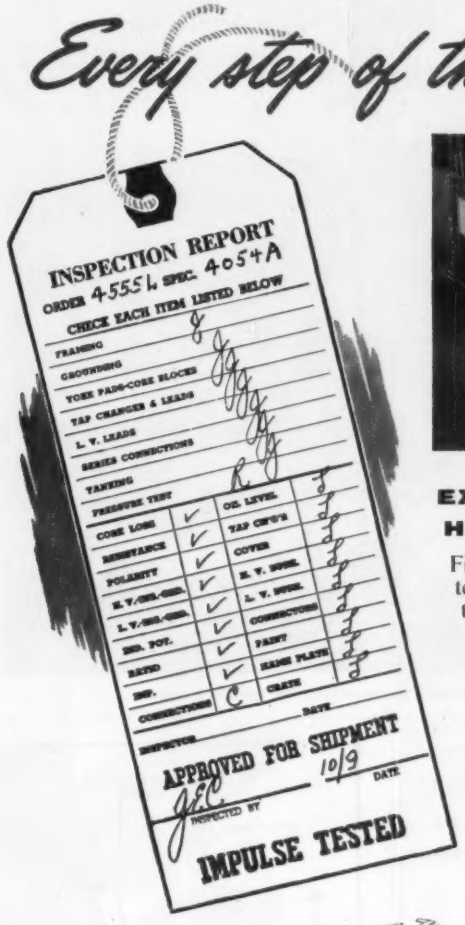
CENTRAL

TRANSFORMERS

are PLUS Tested

Every step of the way!

CTC



We Design and Manufacture Quality Transformers —Nothing Else!

EXTRA Tests Assure Consistent and Uniform High Quality In Every Central Transformer

Final testing of the finished product is a basic step in Central's production technique. Standard ASA tests represent only part of Central's final testing procedure. Below are some of the PLUS tests—conducted at no extra cost to the customer—which insure uniformly high quality in all Central Transformers:

- Central Distribution Transformers, 167 KVA 15 KV and below, are Production Line Impulse Tested.
- Central Transformers above 167 KVA or 15 KV and every fifth unit 167 KVA 15 KV and below are tested for Insulation Power Factor and Insulation Resistance.
- Just prior to crating, the oil in EVERY Central Transformer is sampled for Dielectric tests.
- Every drop of oil in Central Transformers is monitored by a Doble Water-in-Oil Meter.
- Central's 1600-KV Impulse Generator and other test facilities assure positive selection of only the finest, top-grade materials.

Remember, the "extras" are standard in all Central Transformers.

Just one more reason why Central Transformers are PREFERRED throughout the nation

Central TRANSFORMER CORPORATION

PINE BLUFF, ARKANSAS

Telephone JEfferson 4-5332

NEMA

Sales Offices in Principal Cities

WEPCO Constructs 74-Mi Power Line

Double-circuit steel towers used for 132-kv line; project is joint effort of Milwaukee utility and its northern Wisconsin subsidiary

With towers and switchyard steel already erected, stringing of one of the midwest's longest transmission lines will begin this Spring. It's a 74-mile line extending nearly due north-south from Saukville, near Milwaukee, to Forest Junction, near Appleton.

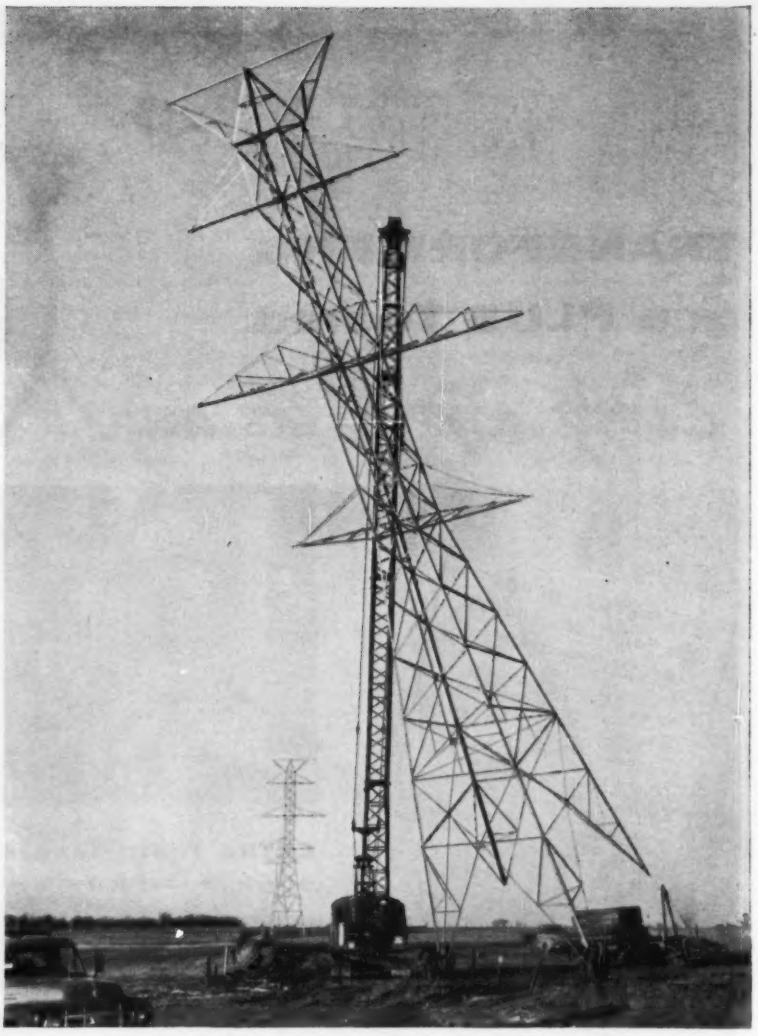
The $4,860,000 project is a joint undertaking of Wisconsin Electric Power Company, of Milwaukee, and its subsidiary, Wisconsin Michigan Power Company, of Appleton. The Electric Company calls the line an important part of a long-range construction program "designed to keep pace with the demands for electric service which are expected to approximately double within that period."

AUGMENTS EXISTING LINES . . . The new line will take part of the load now carried by two 132-kv lines connecting the two systems and permitting an interchange of power. Surplus hydroelectric energy is occasionally transmitted from northern plants to the Milwaukee area, but generally steam-generated power is sent north.

THROUGH KETTLE MORAINE . . . A wide variety of problems was encountered in the engineering and construction of the new line. A large part of the 74-mi route is through fertile farm land, but a section traverses the rough area known as "kettle moraine," piled up by ancient glaciers, and other sections are through swamps.

Fortunately the weather conditions were favorable for field work. Tower erection crews kept to schedule in putting up the 458 double-circuit towers designed and supplied for the job by Bethlehem Steel.

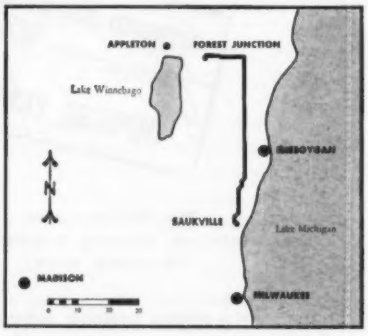
TO BE OPERATED AT 132 KV . . . While the line was designed for 230 kv, it will be operated at 132 kv at the outset. Only one circuit is being strung initially. The 408 suspension towers and 32 angle towers are 130 to 190 ft high. The dead end and transposition towers are 134 ft to 169 ft high. Span lengths average 850 ft.



The utility erected the towers by the upending method.

FABRICATED AT LEETSDALE . . . All the towers were detailed, fabricated, and galvanized at Bethlehem's tower shop at Leetsdale, Pa., near Pittsburgh.

We invite your inquiries for transmission towers and switching structures. West Coast requirements are handled by Bethlehem Pacific Coast Steel Corp., with tower shops at South San Francisco and Seattle.



The new line begins just west of Saukville and, after a few doglegs, runs due north-south until turning abruptly west to Forest Junction, a short distance east of Appleton.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

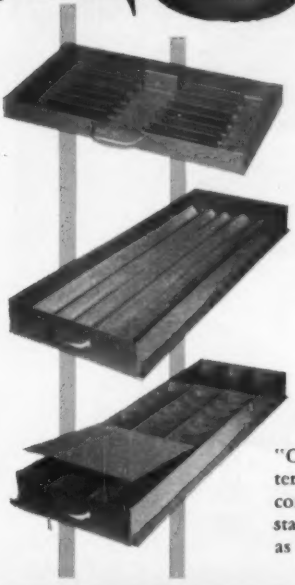
public utility men prefer—

YORK-HOOVER
YMR-76 Service Bodies

MODERN

PROVEN

EFFICIENT



"Custom" features such as material drawers with adjustable compartments are available as standard or optional equipment, as required.

LESS SERVICE HOURS . . .

plus extra savings in operators time are the results obtained by hundreds of YMR-76 Service Bodies in operation today. That's because YMR-76 units are compact and rugged . . . provide ample and convenient carrying space for materials and tools . . . with capacity for adjustment to meet changing conditions. Write for complete details, price and delivery information today!

CLIP AND MAIL TODAY!

Dept. 1E, York-Hoover Corporation
York, Penna.

Please send me a copy of Bulletin No. 942 covering your YMR-76 Service Body.

Name_____

Company_____

Address_____

City and State_____

BODY DIVISION
YORK-HOOVER CORPORATION
YORK, PENNSYLVANIA

CREATIVE ENGINEERING FOR THE PUBLIC UTILITY INDUSTRY SINCE 1892

News about

B.F.Goodrich Chemical *raw materials*

Sanford station of Florida Power & Light Company uses Geon conduit furnished by Hughes Supply of Daytona Beach. B.F.Goodrich Chemical Company supplies the Geon polyvinyl material only.

corrosion problem knocked out . . .

generating station gets conduit of Geon

YEARS from now pulling new cable through this conduit made from Geon polyvinyl materials will be just as easy as it is today. Unlike ordinary steel conduit, Geon conduit resists the corrosive effect of salt water, gases, chemicals and acid or alkaline soils. Internal and external surfaces stay smooth—like new.

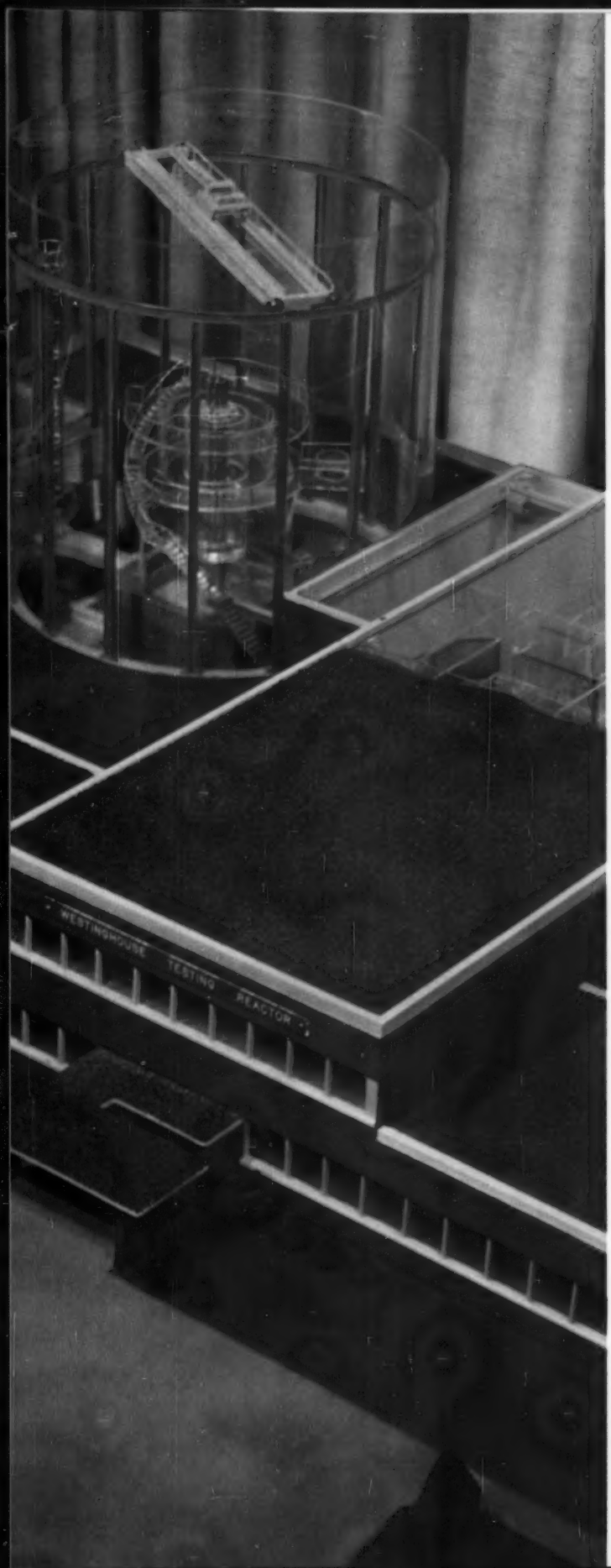
Conduit or pipe made from Geon offers high tensile or impact strength. It stands up under pressure . . . is not subject to galvanic corrosion. It resists sunlight, fungi, bacteria, moisture, heat and cold. And its light weight makes installation especially easy.

Engineers are taking advantage of properties of pipe and conduit of Geon in a wide variety of applications. For information, write Dept. LR-5, B.F.Goodrich Chemical Company, 3135 Euclid Ave., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ont.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR American rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors



New testing reactor speeds atomic power to industry

ANOTHER EXAMPLE OF EARNINGS PLOWED BACK

This center for testing atomic fuels and core materials will speed benefits of nuclear-generated electric power to utilities and industry.

Thirty miles southeast of Pittsburgh lies an 850-acre tract on which the future of electric power is being strengthened. The advanced facilities and techniques being perfected there will serve and benefit all of American industry through the advance of technical knowledge and experience.

The Westinghouse Testing Reactor, to be completed early in 1959, will provide the equipment and environment for testing, under actual conditions of radiation, temperature and pressure, materials and fuels needed for generation of atomic electric power.

Adjacent to the Testing Reactor is the Reactor Evaluation Center, now in operation. Here, core designs and fuel elements for nuclear-fueled electric power plants are evaluated for criticality and proof of design. Core design tests for Yankee Atomic Electric Company's fuel elements are now underway.

Here, and elsewhere, Westinghouse resources of experience, research and development are continuously at work for all producers and consumers of electric power.

YOU CAN BE SURE... IF IT'S

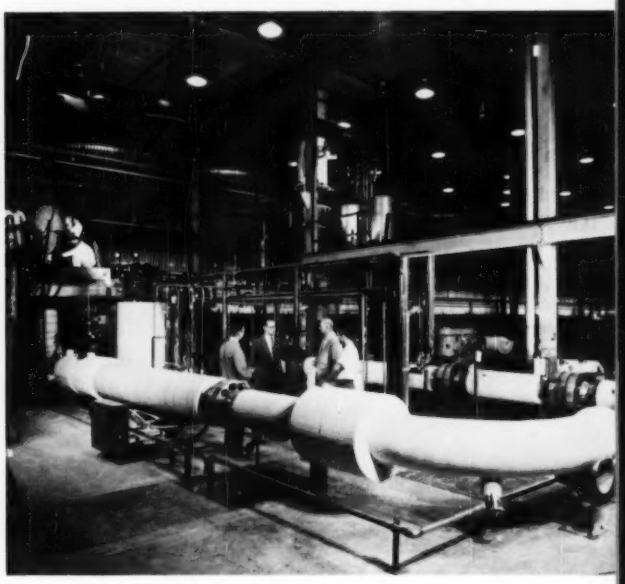
Westinghouse

Westinghouse nuclear testing facilities open a new era in research and development

More than 20 years ago, Westinghouse scientists designed and built the first industrial "atom-smasher" and pioneered a host of developments which have helped make the Atomic Era today's reality. Coupling technical resources and experience with cooperation, Westinghouse and the electric utility industry are making tremendous strides in the development of nuclear-generated electric power. JI-97231-2

The critical experiment room of the Westinghouse Reactor Evaluation Center, where actual evaluation of fuel elements and nuclear core designs takes place. Here, core designs for the Yankee Atomic Electric plant are being tested for criticality, temperature coefficient and other nuclear characteristics.

These facilities and techniques will put nuclear-generated kw's into power lines sooner . . . an outstanding example of Westinghouse policy of putting earned dollars to work in research and development—for *you*.



Westinghouse and Pennsylvania Power & Light Company are presently engaged in design study of the Pennsylvania Advanced Reactor project—an aqueous homogeneous reactor which is fueled by a slurry of uranium and thorium oxides suspended in water.

Components in this slurry test loop approach the size of those which would be used in the actual plant. Construction and testing such as this enables Westinghouse and PP & L engineers to resolve major design problems during the development program.

YOU CAN BE SURE...IF IT'S Westinghouse

The Electrical Newsletter

FUTURE NEWS ▶ **Opinion is already shaping up in favor of 460 kv** as next logical upward step in transmission voltages beyond 345 kv. Corridor conversations at American Power Conference (p 119) suggest 400 kv is too small a step; that 460 kv is attractive to the many 230 kv users, who see in it opportunity for a five-fold hike in capacity.

NRECA's organization may be due for some changes if it accepts recommendations of Rogers, Hill & Slade, management consultants . . . A large all-inclusive co-op association is in the talking stages.

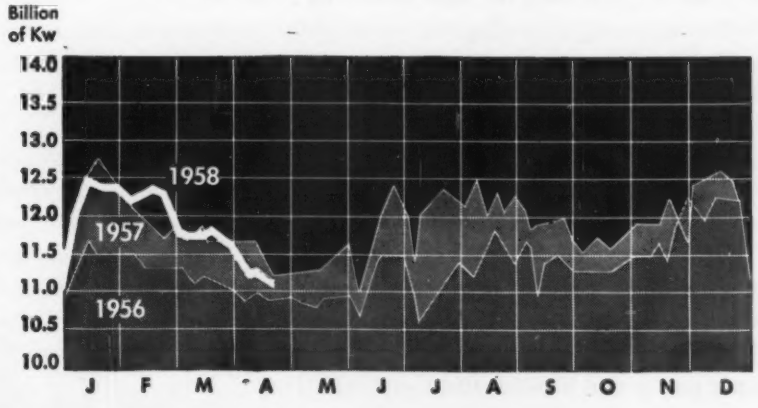
LATE NEWS ▶ **Private enterprise should be permitted** to "join with the federal government and local agencies in building hydro projects in Pacific Northwest," believe 60% of 6,000 people in Washington's Sixth District polled by Rep Thor Tollefson (R-Wash.). About 34% opposed it.

System energy sales and total operating revenues of El Paso Electric should increase about 10.6%/yr until end of 1960, W. V. Holik, president, told N. Y. Security Analysts. Earnings/common for the 12 mos ended March 31 were $1.43, vs $1.33 a year earlier.

GE ups Robert Paxton to president and Ralph J. Cordiner to board chairman, succeeding Philip D. Reed, who retired as chairman . . . At annual meeting, Cordiner launches "Operation Upturn" to build sales and jobs in 1958 and to accelerate business upturn.

Management changes . . . VEPCO elects Erwin Will executive committee chairman and vice chairman of the board, and A. H. McDowell, Jr, president . . . At Houston L&P, W. A. Parish rose to board chairman and chief executive officer; T. H. Wharton to president; and P. H. Robinson to executive VP . . . A. J. Watson, Jr, becomes Mississippi Power prexy; L P. Sweatt, board chairman . . . Missouri PS ups R. C. Green to president; R. J. Green to chairman.

POWER OUTPUT—Down 3.3% (Week ending April 19), Kwhr 11,107,000,000



Per Cent Change From Previous Year

	Apr 5	Apr 12	Apr 19
Total U.S.	−3.1	−3.3	−3.3
New Eng.	−2.1	+0.6	+1.3
Mid. Atlantic ..	−2.9	−2.5	−2.3
Cent. Ind.	−8.1	−6.0	−6.2
West Cent.	−1.3	−1.0	−0.6
Southeast	−0.3	−1.2	−1.6
South Cent.	−1.6	+0.2	−1.4
Rocky Mount...	−0.8	−0.7	−0.8
Pacific			
NW	+0.1	−6.4	−8.1
SW	−2.1	−7.5	+3.9

Seasonally Adjusted Index 219.2

Week Ago 222.7 Year Ago 226.0

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World Estimate). Excluding AEC, output decrease was 2.7%.

A TWO-MINUTE PREVIEW OF THIS ISSUE

WASHINGTON ▶ **How much safety should be built into nuclear power plants?** And is it better to be over-safe at the risk of raising costs and thus delaying competitive A-power? This dilemma, shared by today's electric power industry and the government, is magnified by our scanty knowledge of the various hazards involved. The problem is now resting in the hands of AEC's licensing and regulation division (p 74).

ATOMIC PROGRESS ▶ **The dynamic field of A-power generation is entering a new era**—one in which operating experience, meager as it is, can be analyzed. The results, based on the experience gained by close observation of the five pioneer reactors now operating in the U.S., are encouraging. And in some cases, they've surpassed the expectations of their designers. To keep up to date in this fast-moving field, you won't want to miss our wrap-up, complete with six pages of tables of projects in design or under construction. You'll find it all in EW's Third Annual Nuclear Power Report starting on p 77.

MANAGEMENT ▶ **What's new in the electric power field? And what's ahead?** These two questions, so vital to electric utility management, got full treatment at the recent American Power Conference in Chicago. The discussions, led by experts representing all phases of the industry, covered new developments in pump storage, the latest in turbine design, progress in the nuclear energy field, the advantages of digital computers, operation of the large power interchanges, and EHV transmission (p 119).

TRANSMISSION ▶ **Iowa P&L finds backfilling is quicker and more efficient** with a recently developed special rig. The device, a crawler tractor which pulls a semi-trailer, sends wet crushed stone into the ground to brace 161-kv H-frame structures against high winds (p 98).

DISTRIBUTION ▶ **Linemen can be protected from electrical contacts** with a new pole-top scaffold. The 25-lb insulating platform has a wooden frame covered with Fiberglas and preserved with linseed oil (p 100).

Many hot-line troubles can now be solved from the ground, thanks to a 28-ft telescoping glass fiber rod which comes with a variety of attachments. The 7-lb, tapering rod can be used successfully in all but the strongest of winds (p 100).

MEETING ▶ **Now is the time to re-examine distribution design for future homes,** in light of the predicted large home air-conditioning market, declared Westinghouse's R. F. Lawrence at a recent PCEA meeting. He urged full-scale installation to prove the desirability of higher secondary voltage in the homes . . . The upsurge of air conditioning has caused nationwide changes in load patterns, averred Arizona PS's R. E. Reinbold . . . Other meeting highlights included talks on progress in atomic power and EHV transmission (p 91).

METERING ▸ **A suitcase-sized kit that holds all needed meter testing equipment** compactly and neatly is being used by Minnesota P&L's Little Falls Division. The portable set is used with a 4-ft step ladder **(p 98)**.

INDUSTRIAL ▸ **A Texas firm isn't exaggerating when it says it cut drying time 95%** for gluing veneer to doors and table tops. Installation of a 12-kw electric drying oven, with 2-hp vacuum pump, reduced drying time to 15 minutes. Process formerly took six hours **(p 127)**.

By converting to electric power, a Harrisburg (Pa.) standby water pumping station is realizing lower overhead costs and can achieve a fast start-up during emergencies **(p 127)**.

SELLING ▸ **Alligators, jalopies, and teen-agers have one thing in common**—they can all be washed with electric hot water for only 1¼¢. So claims a new series of light-hearted and eye-catching cartoon ads now appearing in 140 newspapers in Kansas P&L's area. The imaginative ads have two goals: to attract the reader and to create consumer comment on KP&L's new low rates through the use of unusual situations **(p 128)**.

NEW EQUIPMENT ▸ **You can now buy a 46-kv breaker filled with sulfur-hexachloride.** The new unit, with 250-Mva interrupting capacity, is economical in isolated or unattended installations . . . A new metal-enclosed recloser switchgear for 2.4 to 15-kv circuits is available in three bus continuous current ratings: 800, 1,200, and 2,000 amp . . . The latest model polyphase w-h meter is 40% smaller, 28% lighter than predecessors **(p 108)**.

MANUFACTURERS ▸ **If it takes a few men one day to erect a substation . . .** No, this isn't a hypothetical problem in mathematics. Now it can be done, by means of Kaiser's new "Alrectic" method of erecting substations quickly with standard prefabricated aluminum components. Aside from savings in engineering, assembly time, and maintenance, the method offers flexibility . . . Baltimore G&E orders a 7,500-kva vapor-cooled, gas-insulated transformer from Westinghouse **(p 102)**.

Octafluorocyclobutane is the tongue-twister coined by Du Pont for its new gas, composed of carbon and fluorine, which is expected to bring about lighter electrical equipment for high voltage uses **(p 106)**.

PEOPLE ▸ **Three newly elected vice presidents** at Louisville G&E are A. G. Rosenbaum, A. J. Kieffer, and W. I. Lukenbill . . . In key engineering appointments, Duquesne Light ups J. Stanley Brown to chief engineer, Engineering & Construction Div; Washington Water Power elevates C. E. Cannon to chief engineer; Baltimore G&E advances George S. Harris to chief engineer, Electric Div; and Pacific G&E promotes J. Dean Worthington to chief civil engineer **(p 132)** . . . J. C. Strasbourger joins Muncie Engineering as executive VP . . . At Hubbard & Co, C. A. Liming becomes sales manager, Electrical Apparatus Div **(p 135)**.

Wisconsin Public Service Commission ruled on Dec. 19, 1957 that "propaganda" advertising was not allowable as an operating expense for rate making purposes. Wisconsin is the third state to take this position (other two are Minnesota and Texas). "The commission was careful to preserve unto the companies the historically recognized right to engage in institutional advertising which permits the expenditure of operating funds for product advertising and the affirmative position of the service offered by such companies . . . I consider the result to be philosophically and economically sound and consistent with the public interest. The underlying philosophy is that the interest to be protected by such advertising expenditures is primarily a stockholder interest rather than the interest of a rate-payer."—**Wisconsin Governor V. W. Thomson, in Rural Electrification Magazine, April, 1958.**

TECHNICAL NOTES

Difficulties in scheduling turbine generator overhauls will increase as the use of larger units will mean overhauling periods of longer duration.

Cold water holds more oxygen in solution than does warm water. At 50F the oxygen concentration of water is 11.3 ppm. At 80F it is 8.1 ppm.

Mechanism of flashover protection afforded by silicone grease on insulators is explained by tests that show treated insulators collect more soluble salts than untreated ones, but deposits on treated insulators yield salts to water solution at a much lower rate than do untreated units. This indicates an enveloping action of the compound.

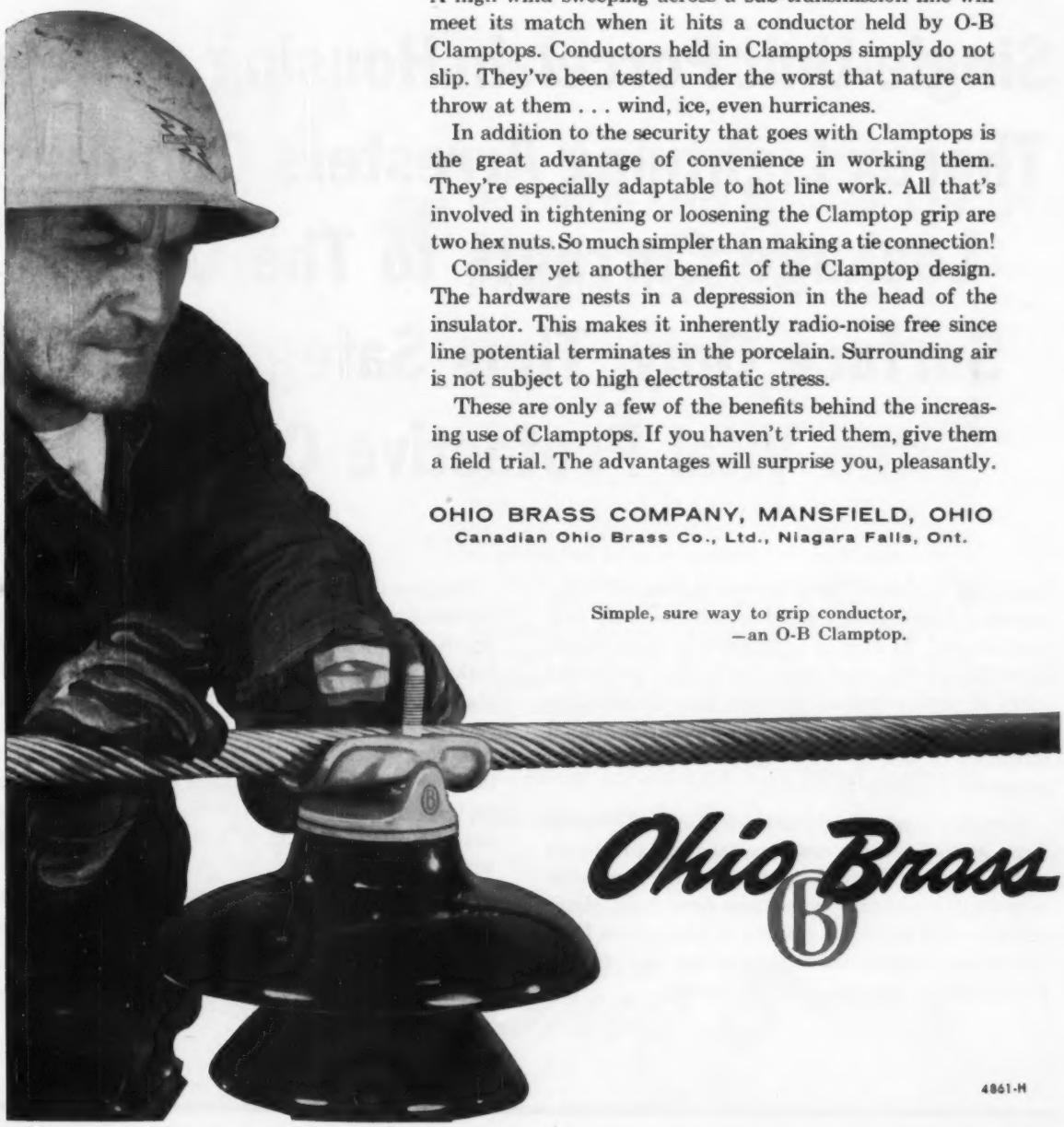
Undesirable aquatic growth in hydroelectric power plant water races can be prevented by the exclusion of oxygen on the lining of the races. Australian researchers accomplished this by removing plants from all surfaces of the empty race first and then painting or spraying the surfaces with a viscous formation of sodium silicate.

FROM EDITORS IN THE FIELD

About $30 million is spent annually in the United States to verify periodically the accuracy of single phase meters, based on an 8-year service period. By reducing the need to service meters to one replacement every 32 years, servicing costs would be reduced by $24 million a year.

"Want to get a good grip on your conductor?"

O-B CLAMPTOPS MAINTAIN THEIR SURE GRIP UNDER HEAVY WIND AND LOAD



A high wind sweeping across a sub-transmission line will meet its match when it hits a conductor held by O-B Clamptops. Conductors held in Clamptops simply do not slip. They've been tested under the worst that nature can throw at them . . . wind, ice, even hurricanes.

In addition to the security that goes with Clamptops is the great advantage of convenience in working them. They're especially adaptable to hot line work. All that's involved in tightening or loosening the Clamptop grip are two hex nuts. So much simpler than making a tie connection!

Consider yet another benefit of the Clamptop design. The hardware nests in a depression in the head of the insulator. This makes it inherently radio-noise free since line potential terminates in the porcelain. Surrounding air is not subject to high electrostatic stress.

These are only a few of the benefits behind the increasing use of Clamptops. If you haven't tried them, give them a field trial. The advantages will surprise you, pleasantly.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Simple, sure way to grip conductor,
—an O-B Clamptop.

Ohio Brass

4861-H

Safe on the

Single-Unit Porcelain Housing of New Thorex Lightning Arresters Confines Leakage Currents to The Outer Surface Only, Thus Safeguarding the Vital Protective Circuit

Lightning arresters have always depended upon porcelain housings as a weather seal, *and only as a weather seal.* As long as arresters were constructed of multiple units, each stack connection permitted entry of surface leakage currents into the sensitive internal protective circuit. Therefore, the radial insulating action of the housings was nullified at numerous points in the stack.

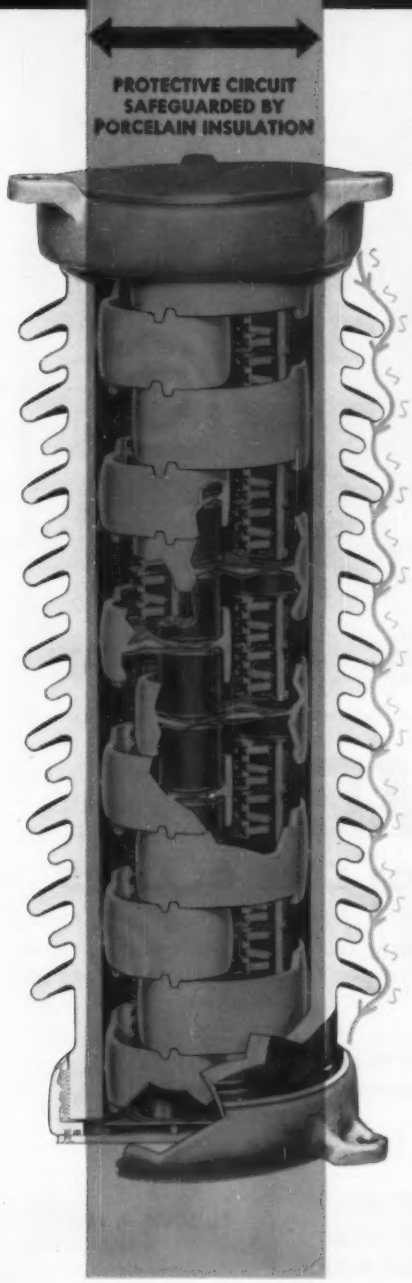
Now, this is completely changed. Thorex Dynagap Type MPR lightning arresters take full advantage of their radial porcelain insulation. This is possible because all stacking connections have been eliminated -- the porcelain housing is continuous from end to end. Leakage currents have only one place to go, namely, to ground *over the outside.*

Single-unit, continuous Thorex housings have mastered a heretofore un-solved problem in a simple, practical way. In the past, heavy external surface leakage currents, entering through the end caps of stacking units, and thus being super-imposed on the sensitive protective circuit have led to cases of failure. Now, when kept in their place, these leakage currents are harmless and can no longer cause partial or total arrester internal sparkover. Thorex single-unit housings do this, without complication and without question.

Put self-protecting Type MPR arresters on your major station apparatus and enjoy an entirely new order of safety.

OHIO BRASS COMPANY, MANSFIELD, OHIO

INSIDE!



No Path of Entry Exists for Leakage Currents to Reach Sensitive Protective Circuit

Simple and effective principle of high voltage Thorex Dynagap lightning arresters, used in combating the damaging action of surface leakage resulting from contamination. By the use of continuous porcelain housings -- minus all intermediate unit end connections -- leakage currents have only one place to go, namely, to ground. In doing this, they are rendered harmless. If introduced into the internal circuit -- as permitted by intermediate unit end connections -- these currents can lead to un-necessary partial or total internal arrester sparkover, with associated hazards to arrester life. Thorex arrester design, for the first time, uses the adequate radial dielectric strength of the porcelain housing to isolate previously destructive leakage currents.

Surface Leakage Current Bleeds Harmlessly to Ground

Ohio Brass

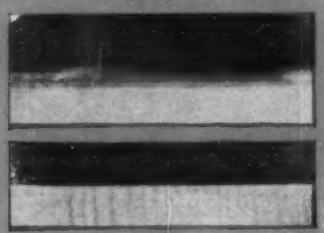
4900-H

NEW!
HOT LINE CLAMPS

WITH MACHINED WIRE-BEARING SURFACES

ONLY WEAVER

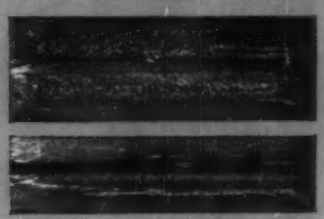
machines both wire-bearing surfaces to make them perfectly smooth, straight and parallel. Result: Full conductor contact across the clamp. No rough spots to cause arcs.



unretouched photos

COMPARE

any other clamp with Weaver. Rough wire-bearing surfaces invite trouble!



unretouched photos

WEAVER
LUBRICATED HOT LINE CLAMPS

Two sizes cover most requirements—
why carry needless inventory?

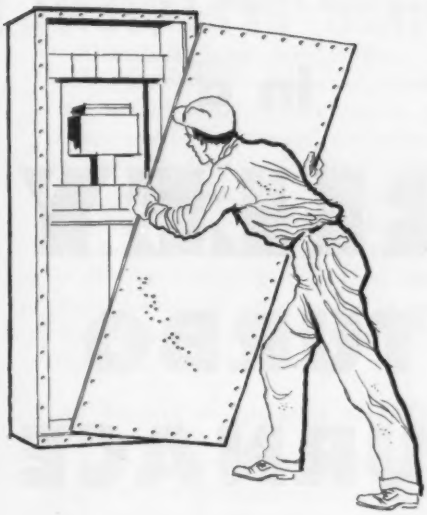
SAMPLES ARE AVAILABLE FOR TESTING BY YOUR ENGINEERING DEPARTMENT. WRITE TODAY.

J. A. WEAVER Company

2110 HOWARD ST. ST. LOUIS 6, MO.

CE. 1-8100

METAL-CLAD SWITCHGEAR



HOW MUCH DO YOU NEED A HINGED REAR DOOR?

Some switchgear makers say you don't need it at all. They say you should struggle with a 75-lb. sheet metal cover and grope for the screw holes. That's good enough for you, they say.

But I-T-E gives you hinged rear doors as standard equipment on metal-clad switchgear—at no extra cost. And many other features besides. More solid construction throughout . . . means longer life. Sturdier enclosures to simplify installation. Finer finishes to give your whole switchboard a richer look. Examine an I-T-E switchgear installation. It is just plain better built. But you pay no more.

How much do you need I-T-E's double blowout coils —standard on 15 kv circuit breakers? Under all fault currents, here is extra protection, plus assurance of longer circuit breaker life that no other switchgear offers you. Yet I-T-E charges you no more.

Recently I-T-E developed FLAMETRAP insulation that snuffs out flame in seconds and leaves no toxic fumes. It is today's most advanced flame retardant insulation—now yours on I-T-E switchgear for no extra cost.

This briefly is I-T-E's policy: to make its switchgear better, in construction, performance and appearance—but to charge no more. Why not make sure that you get all the value your switchgear dollars can buy. Get I-T-E switchgear. For a complete outline of our extra-quality features, write Switchgear Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada: Eastern Power Devices Ltd., Port Credit, Ont.

I-T-E CIRCUIT BREAKER COMPANY
PHILADELPHIA, PENNSYLVANIA

Why You Get HIGHER EFFICIENCY in a RILEY TURBO FURNACE

The Riley Turbo Furnace, a new concept in furnace design, has created unusual interest in the power industry. Already, in only a few short years since its introduction, twenty-three Turbo Furnace units with a total steam capacity of 14,000,000 lbs/hr have been bought by public utilities and industrial companies. Sizes range from 125,000 lbs/hr to reheat units of 1,650,000 lbs/hr and are being installed for the most part as multifuel units to burn oil, gas and coal. Three units are already successfully burning the newest of petroleum by-products fuels: Fluid Coke.

One of the most attractive features of the Turbo Furnace is its high furnace efficiency. Firing of fuels at the bottom of the circulation system makes possible full utilization of furnace waterwall surfaces from top to bottom and permits higher heat release per square foot of furnace envelope. Vertical displacement of furnace gases results in clean, slag-free furnace surfaces and a uniform distribution of furnace heat across the entire width and depth of the furnace.

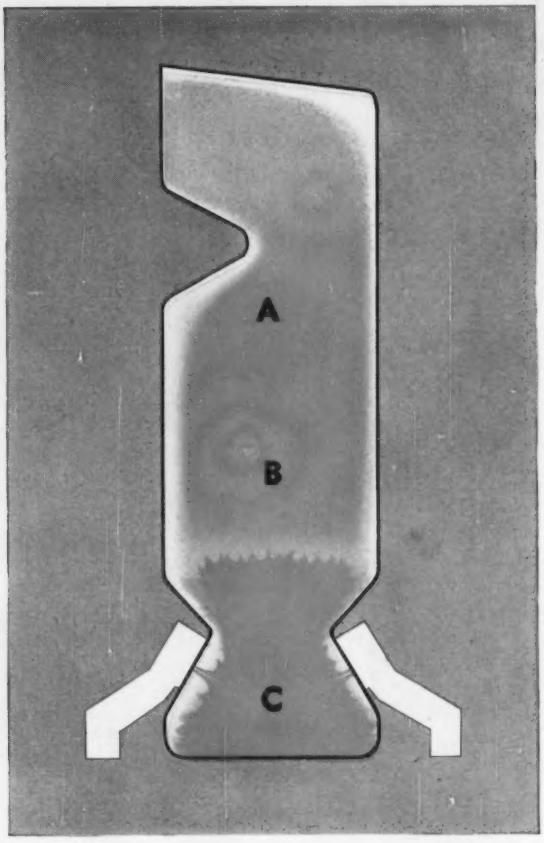


Fig. 1. Flame and Furnace Gas Characteristics of the Riley TURBO FURNACE

High Furnace Turbulence
High Burn Out Rate

As can be seen in the furnace cross section, Figure 1, air and fuels enter the combustion zone of the Turbo Furnace in a downward linear direction from Riley Intertube Directional Flame Burners arranged for opposed firing across the width of the furnace. The opposed streams of fuel and air intermix in the center of the furnace (over the slag pool when pulverized coal is burned) to produce a highly, turbulent area of combustion which fills all the area below the furnace throat. Long residence time of fuels in the area results in a negligible loss of combustibles.

A survey of your plant by a qualified consulting engineer could show ways of making surprising savings in your power costs.

RILEY
STEAM GENERATING & FUEL BURNING EQUIPMENT

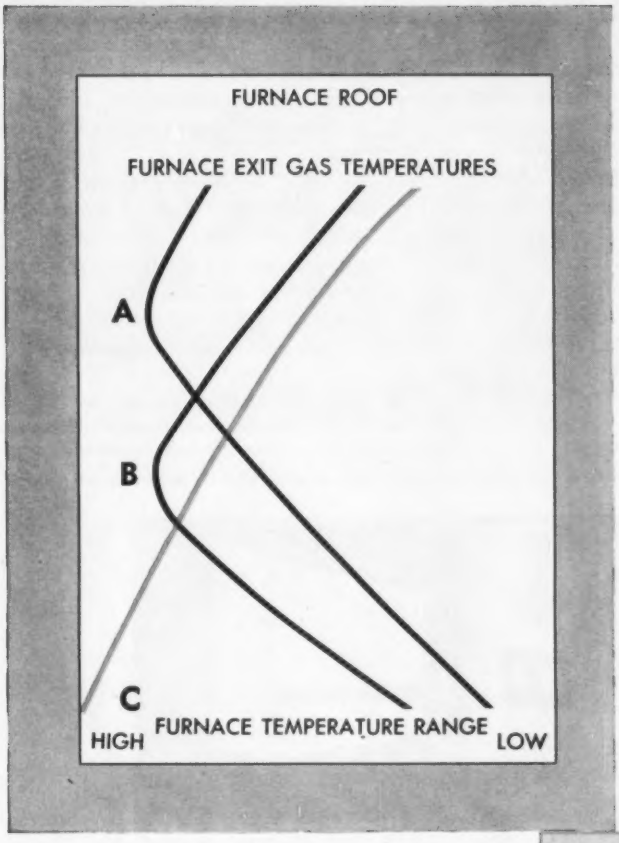


Fig. 2. Furnace temperature curves resulting from heat concentration at various furnace levels. (A) Above center of furnace (B) below center of furnace (C) bottom of furnace

Clean Furnace Walls — No Slagging

Since combustion takes place almost entirely within the furnace bottom very little flame ascends into the upper portion of the furnace. Gases rise vertically without impinging on furnace walls. Heat is released as gases travel toward the furnace exit, cooling to the point where danger of slagging of high temperature elements is reduced to a minimum.

Uniform Heat Distribution At Furnace Exit

A desirable characteristic of furnace performance particularly in larger boilers with wide furnaces is the even distribution of heat across high steam temperature components. In wide Turbo Furnaces this uniformity is furthered by the use of radiant tube platens.

Uniform Furnace Exit Temperatures With Multiple Fuels

The similar flame characteristics of oil, gas or pulverized coal, the completion of combustion in the confines of the furnace bottom, the cooling effects produced by the full utilization of furnace waterwall surfaces result in (1) uniform furnace exit gas temperatures with a given heat release per square foot of effective radiant surface and (2) a marked similarity in the exit temperature of the three fuels (Figure 3). These characteristics make possible the arbitrary use of gas, oil or a wide range of coals with a minimum amount of steam temperature control.

All Burners at Operating Floor Level

Another feature of the Turbo Furnace about which operating engineers are enthusiastic is the fact that all burners, with their supervision and maintenance, are located on one level. This feature permits the location of firing control on the turbine level.

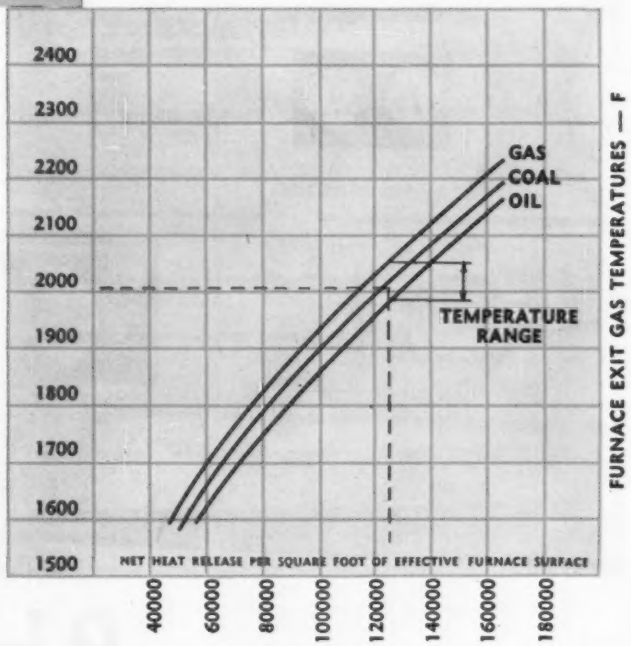


Fig. 3. TURBO FURNACE exit gas temperatures of gas, oil, coal have a maximum variation of approximately 50 F

A Riley engineer will gladly give you complete information about this latest Riley development. Write — RILEY STOKER CORPORATION, WORCESTER, MASSACHUSETTS

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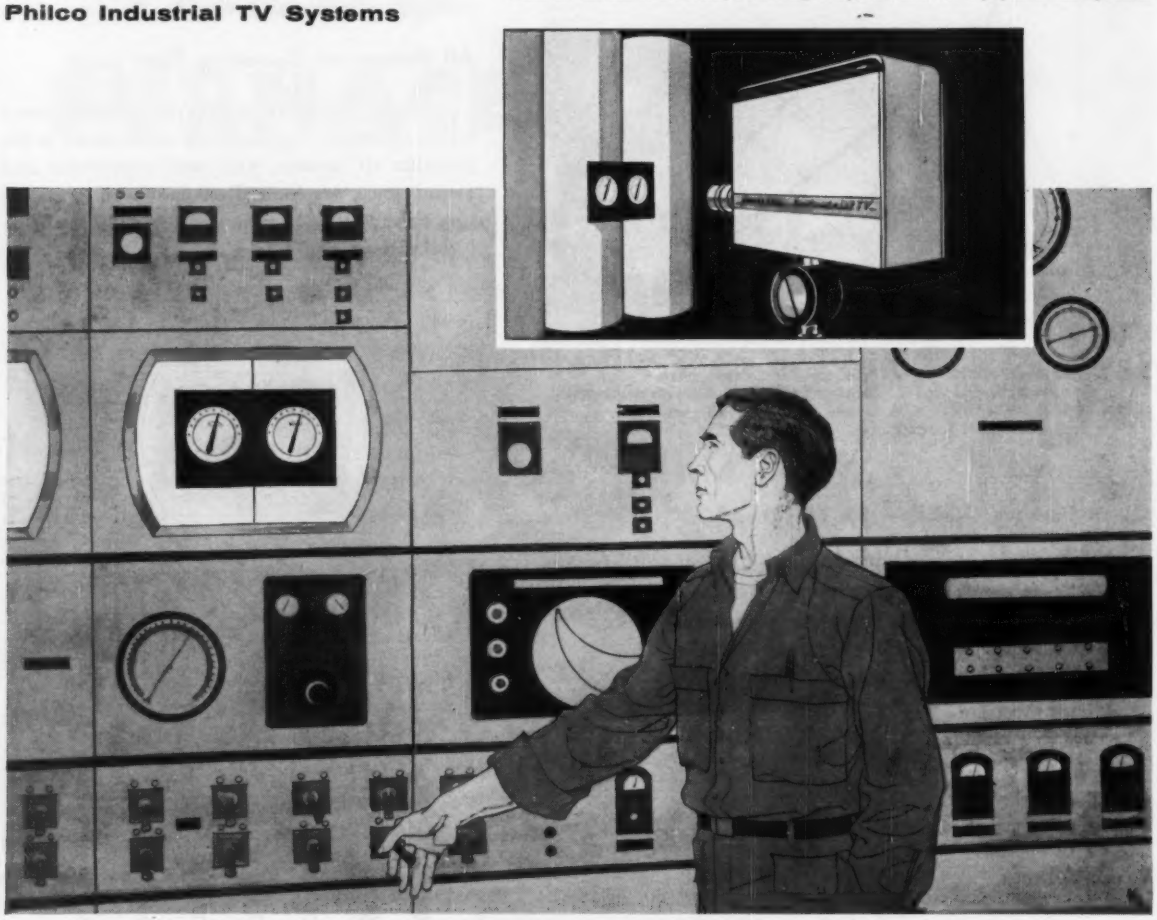

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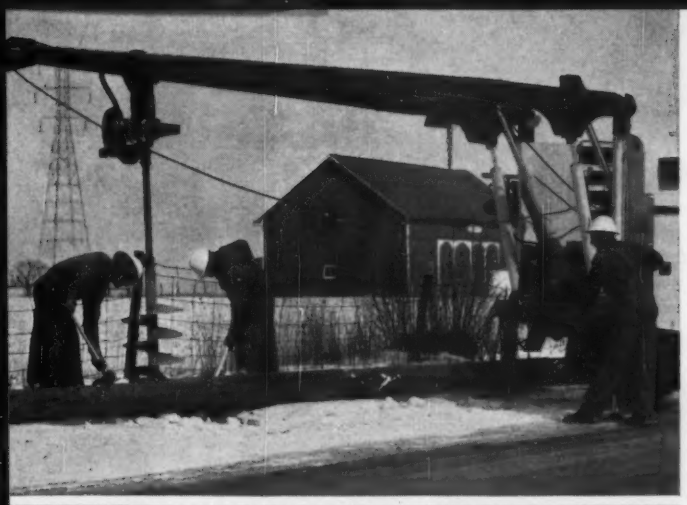

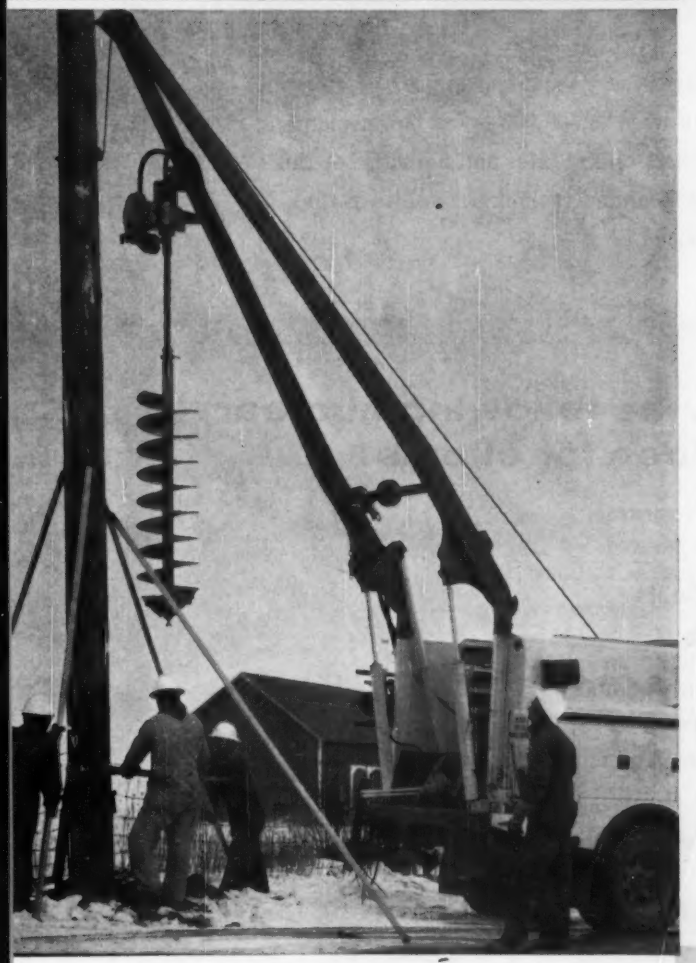

Meet the derrick that has more power in the low ranges

Holan Series 6800 Derrick gets extra power from extra cylinders

As you can see, some people have already met the new Holan Series 6800 Power Derrick—met it, used it and liked it!

They like the two sets of cylinders that give more power in the low ranges—more power for lifting, more power for forcing diggers into hard ground. They like the exclusive dial load-indicator to quickly show capacity in any position. They like Holan's lighter-but-stronger fabricated, rectangular side legs. And they like live-boom action with a single-drum winch.

The 6800 handles 8,000 pounds . . . sets 65-foot poles . . . body-loads 4,000 pounds . . . and lifts 2,000 pounds when only 5½ feet from the ground. To learn some more facts, meet the man who can tell you all about it, a Holan Field Representative. Call or write.

OTHER EQUIPMENT IN THE PHOTO:

Series 4095 Hydraulic Jacks, self-stowing, move to full extension in 8 seconds, return to stowed position in 6 seconds. 14,000-pound capacity.

Body is CMC-164. All Holan bodies are made of hi-tensile, rust-resistant steel 20 to 25% lighter than ordinary steels.

Series 4401-H Hydraulic Earth Borer digs holes 8″ to 20″ wide, 8 feet deep. Power feed attachment in photo uses weight and power of derrick to force digger into ground. Note that hydraulic lines from digger in photo run along side leg instead of hanging loose.

J.H. HOLAN® CORPORATION

4100 WEST 150TH STREET
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OTHER PLANTS: HOLAN CORPORATION OF GEORGIA, Griffin, Ga.
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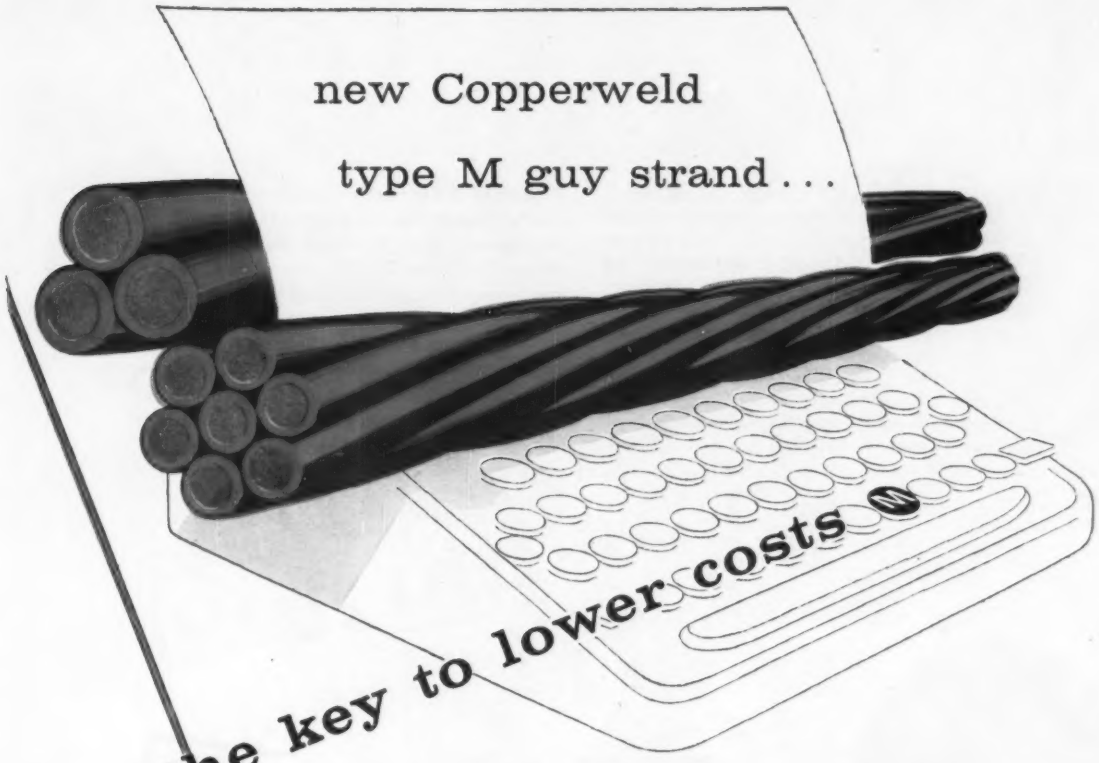

Copperweld* Type M Guy Strand offers double economy: 1. lower first cost, 2. lower maintenance costs. Research and new production techniques make it possible for us to manufacture Type M at savings which are passed on to you. The result is Copperweld quality costing you less than before. And the savings don't end after installation. They continue year after year because Type M Guy Strand requires so little maintenance. It will last as long as modern poles.

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New Copperweld TRADE MARK
TYPE M GUY STRAND

2.2M 4M 6M 8M 10M 12.5M 16M

In 1952 Pioneer joined with other groups, all reporting to the Atomic Energy Commission, for constant study of atomic energy application. Today Pioneer is qualified as a consultant to industry in the application of atomic reactor systems to the generation of electric power. Presently, Pioneer is acting as architect-engineer and supervisor of construction of the 66,000 kw commercial atomic power plant shown here. Allis-Chalmers Mfg. Co. is the prime contractor. Scheduled for 1962 completion, the plant, for the Northern States Power Co., will be known as the "Pathfinder".

Organized as Central Utilities Atomic Power Associates, these utilities will share in the research and development costs: Northern States Power Co., Central Electric and Gas Co., Interstate Power Co., Iowa Power and Light Co., Iowa Southern Utilities Co., Madison Gas and Electric Co., Mississippi Valley Public Service Co., Northwestern Public Service Co., Ottertail Power Co., St. Joseph Light and Power Co., Wisconsin Public Service Corp. **PIONEER SERVICE & ENGINEERING CO.**, 231 South La Salle Street, Chicago, Illinois.

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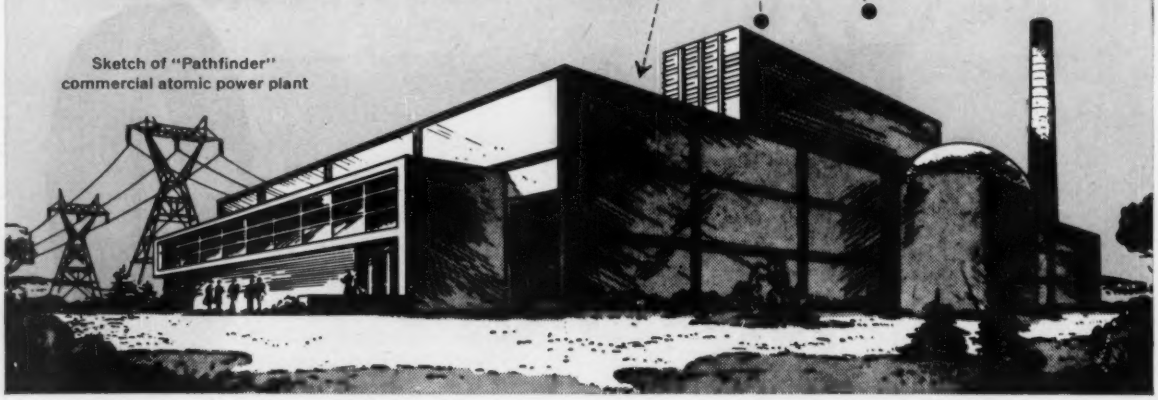
Sketch of "Pathfinder" commercial atomic power plant



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- **Driving studs and couplings interchangeable with all standard sectional ground rods.**
- **Available through Electrical Distributors.**

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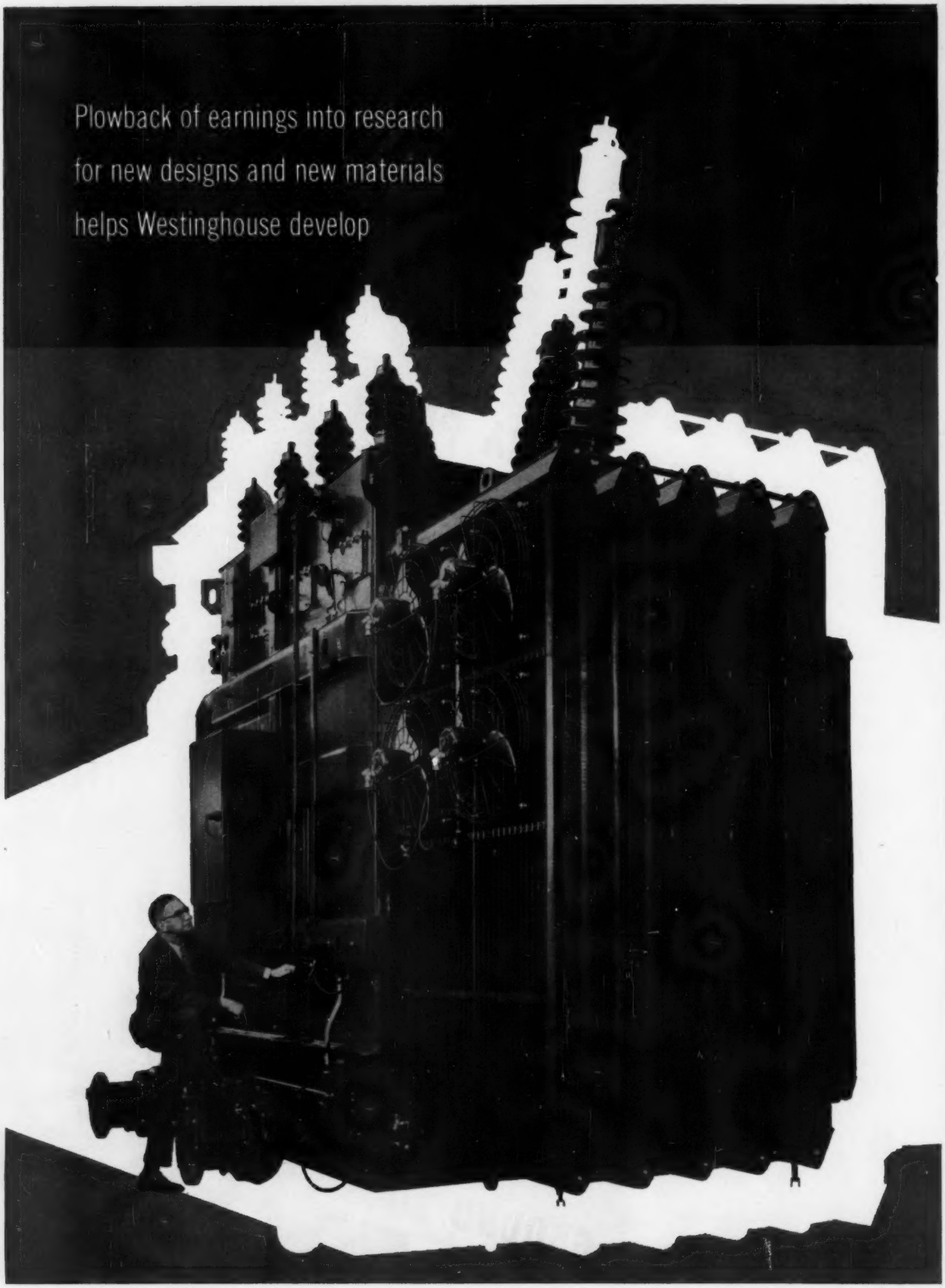

Plowback of earnings into research
for new designs and new materials
helps Westinghouse develop

THE THIRD MAJOR BREAKTHROUGH... NEW INNER-COOLED CONSTRUCTION CRASHES SIZE BARRIER, PAVES WAY FOR SUPERVOLTAGE TRANSFORMERS

Pioneering again, Westinghouse has produced the third major breakthrough in power transformer development.

The first major breakthrough, forced-oil cooling, was developed by Westinghouse in 1940. It made practical for the first time construction of transformers up to 380,000 kva. The second breakthrough, the Schnabel car, also by Westinghouse, raised the practical kva to 450,000.

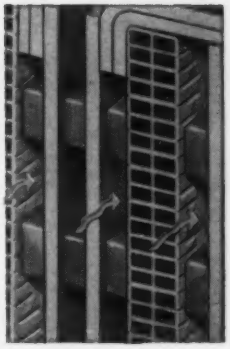
The *third* major breakthrough — Inner Cooling — makes it possible to build and ship transformers with ratings up to 600,000 kva or more. This is the biggest step to date toward construction of transformers that will meet the demands of the future.

Inner Cooling is essentially a means of taking full advantage of the materials used in conventional transformer construction. Present construction places the oil ducts on both sides of the coil consisting of multiple conductors wound in parallel. Inner-Cooled construction places the oil duct between the parallel-wound conductors, with cellulose material between adjacent coils. This construction takes full advantage of the superior dielectric strength of the cellulose material.

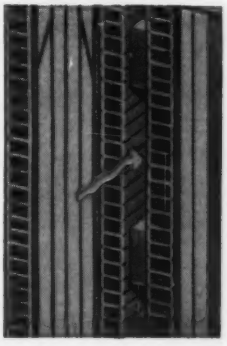
Inner Cooling promises transformers with lower impedances and improved performance, permits more kva in the same area. Space and weight reductions up to 25% for transformers of the same rating are now possible.

Inner Cooling — the third major breakthrough — was made possible through Plowback of Earnings into the far-flung Westinghouse facilities for research and development . . . facilities that are available to all Westinghouse divisions in their search for answers to future problems which are to be faced by America's electric utilities.

Call your Westinghouse representative for the full story on the new Inner-Cooled construction . . . or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-70872

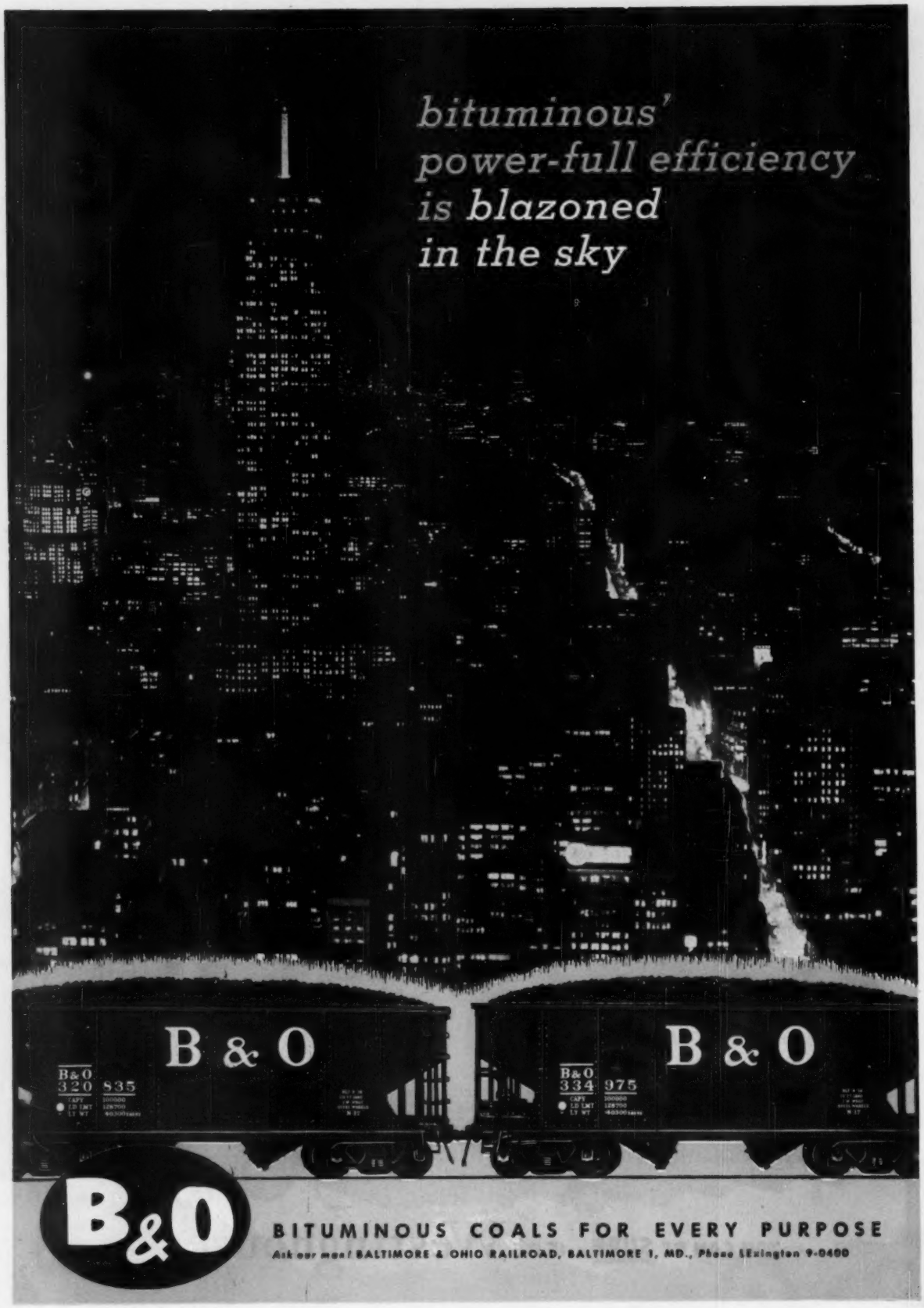


In conventional construction (above), oil flows over the two outside surfaces of the coil. With new Inner-Cooled construction (below), cooling oil flows over the inside of the coil surfaces.



Here is graphic proof of the size reduction afforded by Inner-Cooled construction: the unit shown with Mr. C. W. Miller, Westinghouse Power Transformer Engineering Manager, is an Inner-Cooled Westinghouse 30/50 mva OA/FOA power transformer; the silhouette is that of a transformer with the same characteristics built with conventional construction.

YOU CAN BE SURE...IF IT'S Westinghouse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In hundreds of thousands of applications, only one failure of a Preformed splice has been reported—and that was caused by inadequate preparation of a heavily corroded conductor.

This distinctive performance is the result of soundly engineered features: (1) uniform radial pressure of the splice rods; (2) full area of contact; (3) the flexibility of the rods which causes the grit particles to penetrate existing oxides and establish permanent electrical contact with the conductor; and (4) the inherent resiliency of the splice which maintains consistent surface contact with the conductor throughout extremes of line tension and temperature variation. These combined characteristics are your assurance of unfaltering mechanical and electrical performance at all times.

And, most important, no tools are needed to install a Preformed splice; the application is made entirely by hand and takes but a fraction of the time required for other types of splices.

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LARGEST SINGLE-FURNACE STEAM GENERATOR

WILL DELIVER 2,310,

for Unit No. 4 at Union

New 300,000 kw generating unit will increase station capacity to 860,000 kw

WITH Unit No. 3 still in the final stages of construction, Union Electric Company has already contracted for the addition of Unit No. 4 to the fast-growing Meramec Station. This new generating unit, scheduled for completion in 1961, will be the largest on the Union Electric system, adding 300,000 kw and bringing Meramec Station's total capacity to 860,000 kw.

Steam for the new turbo-generator will be supplied by a Foster Wheeler reheat steam generator with a maximum continuous rating of 2,310,000 pounds per hour — the largest FW single-furnace unit ever built! Pressure at the superheater outlet will be 2200 psig and primary and reheat steam will have a final total temperature of 1010F/1010F, with a reheat steam flow of 1,790,000 lb/hr.

The unit is designed for balanced draft operation, firing pulverized coal. Three Foster Wheeler D-9 Ball Mill Pulverizers will prepare fuel for the 18 FW Intervane Burners.

The new 2,310,000 lb/hr steam generator will take its place beside another FW unit — the 1,850,000 lb/hr twin furnace, dual circulation reheat steam generator for 275,000 kw Unit No. 3 at Meramec Station.

The proved dependability and long-range economy of Foster Wheeler steam generators are backed by more than 50 years of experience in pioneering power plant equipment. We will be pleased to quote on your requirements.

Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, N. Y.

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FOSTER

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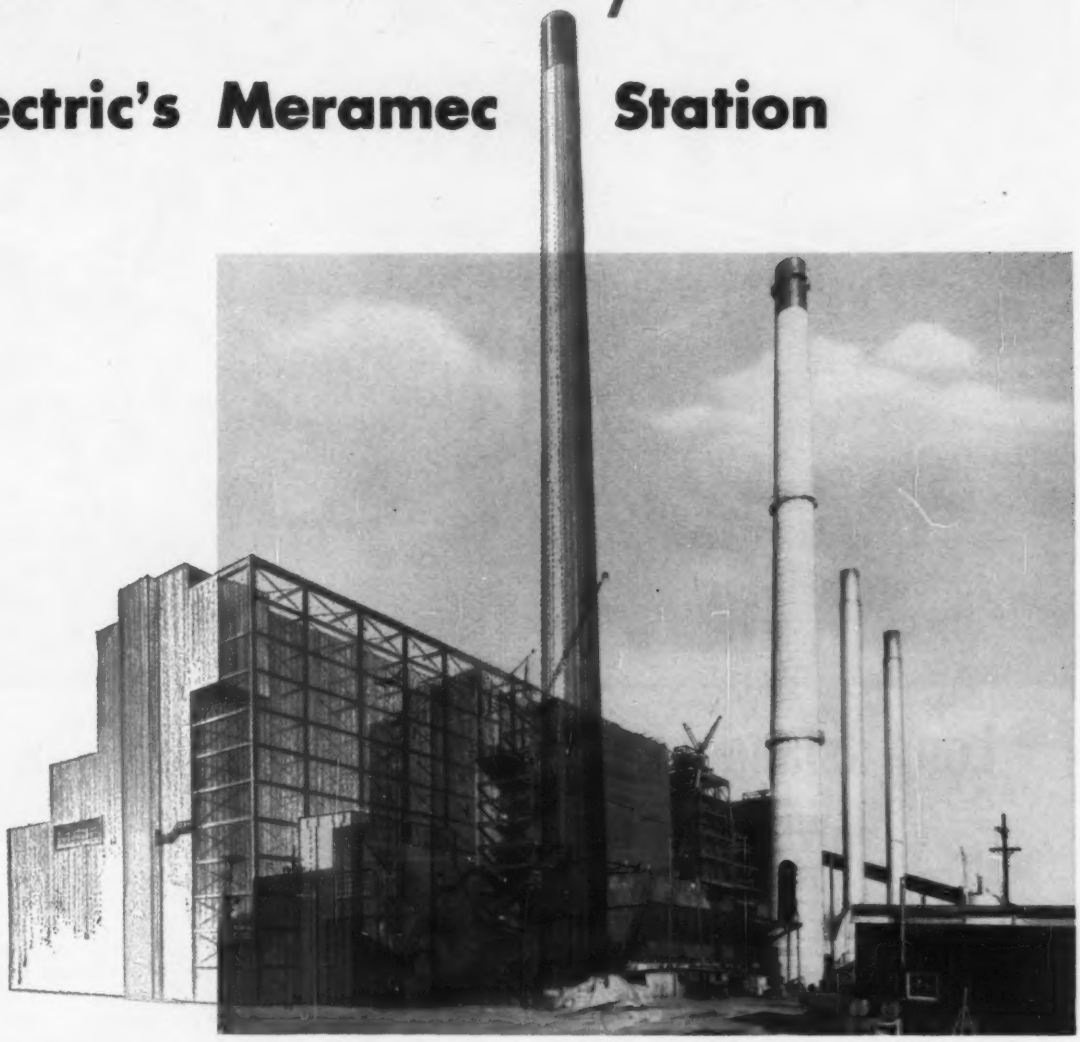
000 lb/hr

Electric's Meramec Station



The photo above shows Union Electric's Meramec Station, with Unit No. 3 under construction. This 275,000 kw unit, supplied by a Foster Wheeler twin furnace, dual circulation reheat steam generator of 1,850,000 lb/hr capacity, is scheduled to go on the line this summer. The artist's sketch, in color, shows the location of 300,000 kw Unit No. 4, which, when completed in 1961, will bring total station capacity to 860,000 kw. The new unit will be served by the largest single-furnace steam generator ever built by Foster Wheeler — with a maximum continuous rating of 2,310,000 lb/hr, 2200 psig, 1010F/1010F.

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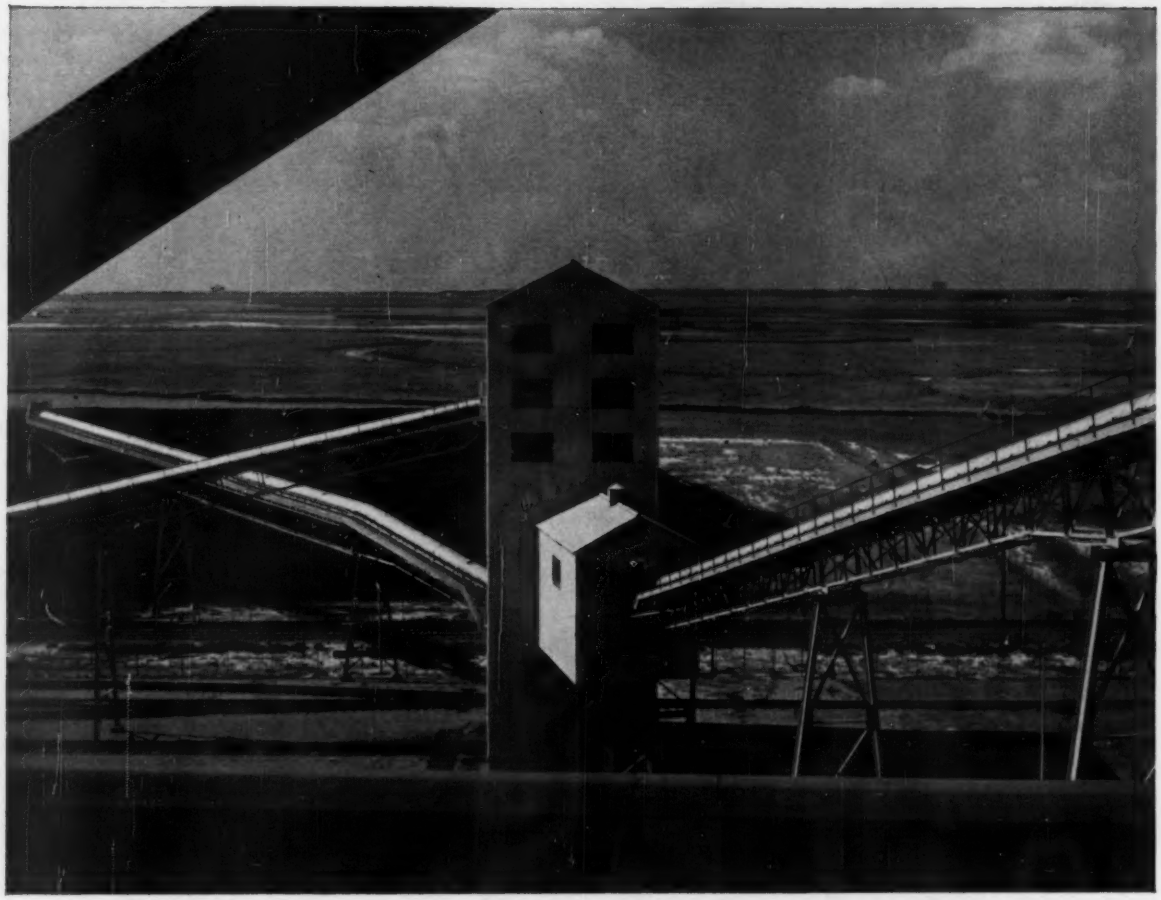
US RUBBER CONVEYOR BELTS



Long Island Lighting takes the long view —with "U. S." Conveyor Belts

In the near future, that wide expanse of meadow in the background is likely to be filled with industrial establishments or housing projects. For this is Nassau County, N. Y., one of the fastest-growing population centers in the country.

To service this rapidly developing area... Long Island Lighting Co. has to plan for the tremendous increase of power needs that will face them 10—20—even 30 years from now. For example, in their new Edward F. Barrett Power Station, the conveyor system is designed to handle more than three times its present daily load of coal.

Planning with such a long view, the utility officials wanted conveyor belts that provided durability and low maintenance—belts that would stand up under the increased demands put upon them by the increased requirements for electric power. So they chose U. S. Rubber Belts *exclusively*.

Long Island Lighting believes this new conveyor system is so reliable that a duplicate system for use in breakdowns is not necessary.

A complete line of conveyor belting plus engineering assistance is available at your local "U.S." Distributor, at any "U. S." Branch, or write us at Rockefeller Center, New York 20, N. Y. In Canada, Dominion Rubber Co., Ltd.

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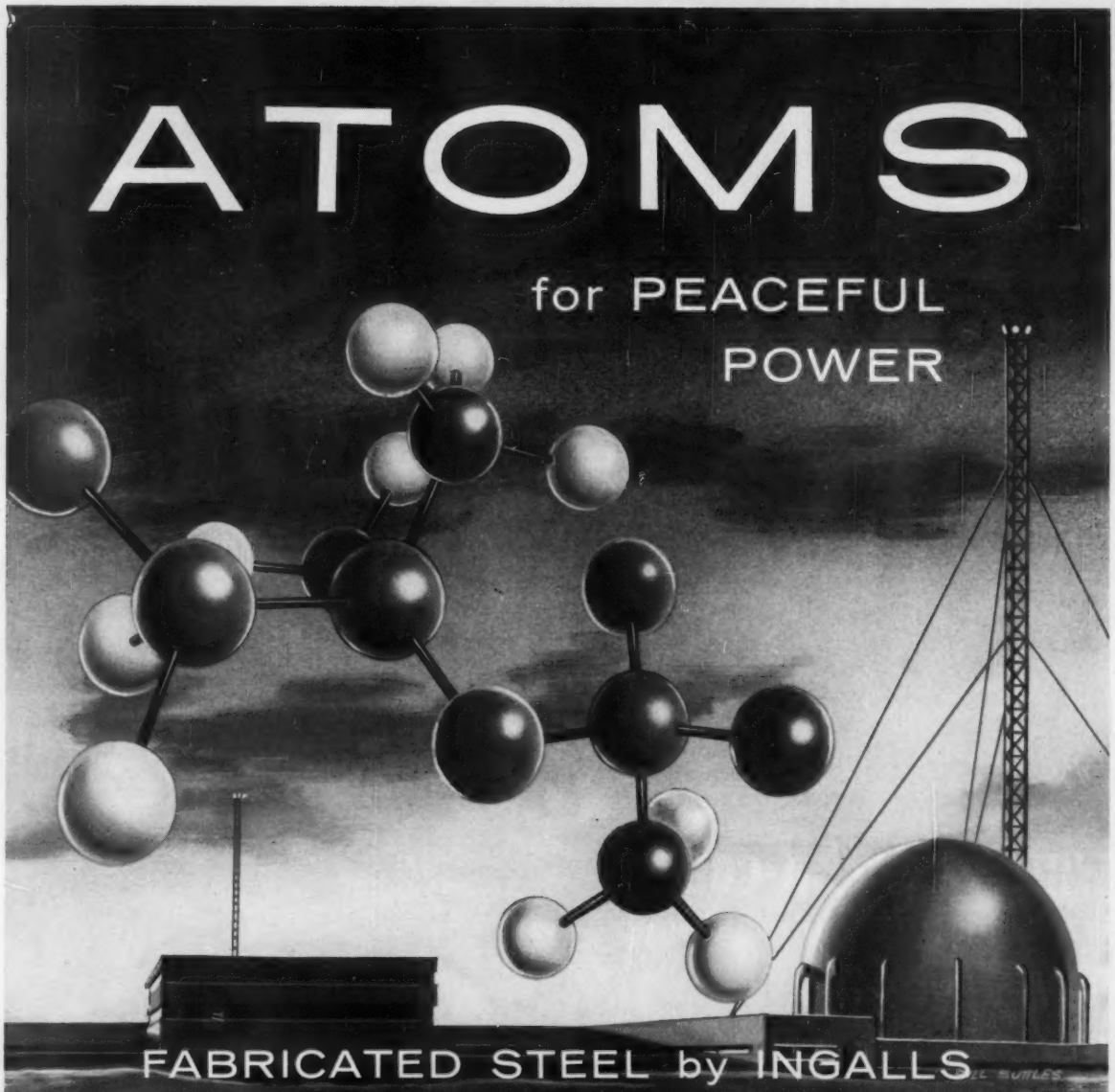

FABRICATED STEEL by INGALLS

The nation's first privately financed atomic power generating station is now underway on the Hudson River at Peekskill, N.Y.

The $55 million station, being built by the Consolidated Edison Company of New York, will produce enough electricity —236,000 kilowatts—to supply the home needs of about a million New Yorkers.

Ingalls, with years of experience in the power plant field, was selected to fabricate the structural steel and erect the $3 million plant, the largest private atomic power generating plant in the United States.

The Ingalls Iron Works Company is a specialist in steel for power plant construction having served 46 Electrical Power Companies on their major power house projects. Our long experience in the field, our modern facilities and modern methods enable us to handle any major contract with speed, economy and efficiency.

If your company is contemplating a new power house, or expansion of present plants, Ingalls offers you its services—fabricated steel, steel erection, or both.

Inquiries invited.

STEEL PLATE FABRICATORS ASSOCIATION FOUNDED 1933

AISC AMERICAN INSTITUTE OF STEEL CONSTRUCTION INC. FOUNDED 1921

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The Ingalls Shipbuilding Corporation, Shipyards: Pascagoula, Mississippi; Decatur, Alabama Sales Offices: New York, Chicago, Washington, Houston, New Orleans, Atlanta

They packed up turbine oil worries at Alton Box Board

six turbines use NONPAREIL Turbine Oil, have life-of-turbine guarantee

Six NONPAREIL Turbine Oil guarantee certificates on the turbine room wall are pointed out by M. D. Jones, Superintendent of the Power and Steam Department. Standard Oil Company's lubrication engineer, W. P. "Sandy" Wehking, helped put most of the certificates there.

Alton Box Board Company, Alton, Illinois, doesn't have a worry in the world about turbine oil. The Company has six turbines in service—four in the power plant and two in the paper mill—all using NONPAREIL Turbine Oil. Why no worries? Because each of these fills of turbine oil is *guaranteed for the life of the turbine* not to exceed a neutralization number above 0.15 mg. KOH/g.

The five Westinghouse and one G-E turbine oil fills have demonstrated a remarkable low acidity record over the years. Regular inspection by Standard Oil technical service representatives and analysis of oil samples by the Standard Oil Research Laboratory, Whiting, Indiana, makes sure the oil is performing in accordance with the guarantee. At Alton Box, neutralization number of the oil has been running 0.02 to 0.03 mg. KOH/g.

This is what such service from a turbine oil means to Alton Box Board: They can run one of the largest board mills in the world without having to concern themselves with the performance of the turbine oil they are using. Standard Oil technical service men inspect the system. The oil is sampled and analyzed regularly. Plant operation will never be interrupted because of turbine oil lubrication failure.

The same performance from NONPAREIL Turbine Oil and service from Standard Oil awaits you. Find out. Call your nearby Standard Oil office near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

How NONPAREIL Turbine Oil is performing at Alton Box Board

Make of Turbine	kw. (H.P.)	Year NONPAREIL Installed	Location	Gal. fill.	Neut. No. mg. KOH/g.
Westinghouse	1,500	1934	Power Plant	85	.02
Westinghouse	3,125	1936	Power Plant	275	.03
General Elec.	400	1936	Paper Mill	50	.02
Westinghouse	1,500	1941	Power Plant	250	.03
Westinghouse	5,000	1947	Power Plant	230	.03
Westinghouse	1,500	1947	Paper Mill	80	.02

Discussing lubrication. Sandy Wehking, Standard's man on the Alton Box Board account, is well qualified to do so. He's been at this work for 15 years. Sandy studied chemical engineering at Blackburn College. He has also completed the Standard Oil Sales Engineering School.

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STANDARD OIL COMPANY (Indiana)

750 MCM Single Conductor 91 Strands, 5KV Shielded SUPER-PARARITE PARAPRENE CABLE.

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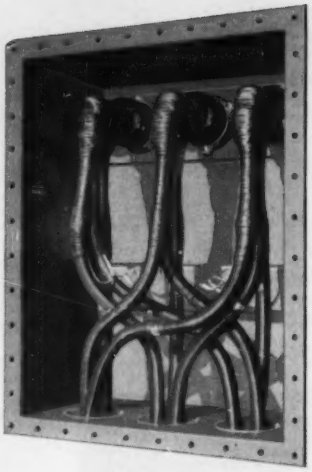


Installed at Turkey Creek

Here's another example of power—Paranite—and American industry . . . the selection of Super-Pararite Paraprene Cable for the new Turkey Creek Pumping Station at Kansas City, Missouri. The Super-Pararite butyl conductor insulation is recognized for superior resistance to heat, cold, moisture, oxidation and ozone, while the Paraprene neoprene jacket possesses inherent resistance to sunlight, abrasion, ozone, heat, oil and chemicals . . . one of many Paranite products which has earned the industry reputation—"IF IT'S PARANITE IT'S RIGHT."®

PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation, Fort Wayne 6, Indiana

MANUFACTURING PLANTS: Birmingham, Ala.; Anaheim, Calif.; Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio

Sales Offices in all Principal Cities

RT&E Transformers

Weather Protected to Serve Longer

Like the postman, neither rain nor snow, nor hail, nor salt spray can prevent R T & E Transformers from doing their duty. Here's proof that every R T & E unit is completely "WEATHER PROTECTED."

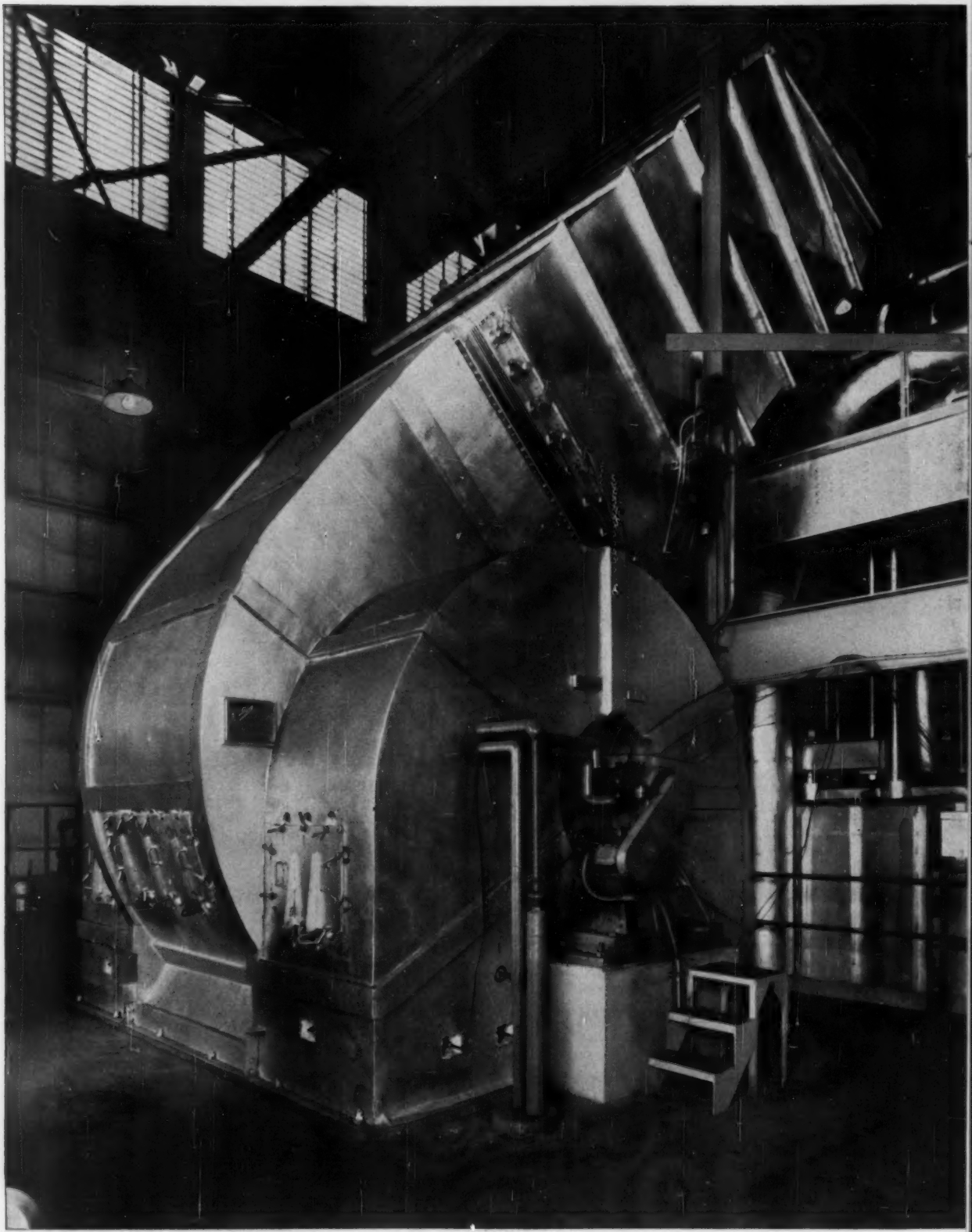
- **FINISH:** Three coats of modified Alkyd paint for all season protection.
- **DESIGN:** Domed cover for immediate water run-off.
- **TANK:** Arc-welded seams and absence of lip on tank bottom mean no moisture collecting cracks and crevices.
- **BUSHINGS:** HV bushings internally clamped — no external clamps and bolts to corrode.

Plus stainless steel cover band to eliminate corrosion on accidentally scratched areas . . . stainless steel threaded mounting pads . . . all unpainted fittings either galvanized or electro-tinned.

R T & E "Weather-Protected" Transformers last longer, require less maintenance, serve better all year 'round.

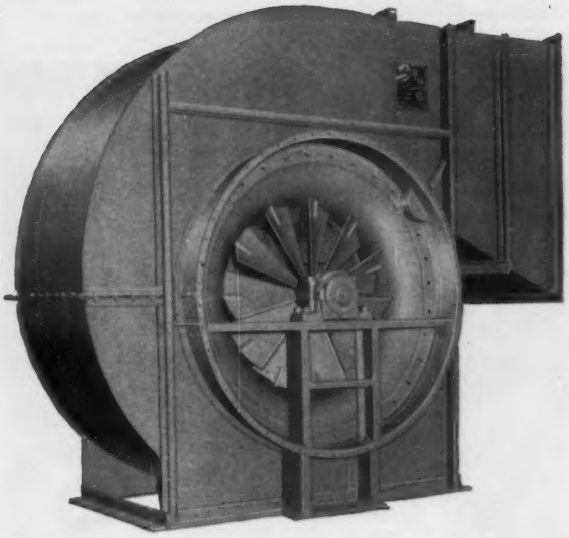
Equipment to help provide power for America.

R T & E CORPORATION
WAUKESHA, WISCONSIN



"BUFFALO" DOUBLE-WIDTH I.D. FAN *in station of one of the largest utility companies. Here, "Buffalo" backward-curve blade design provided the desired balance of high efficiency and long life over the range of boiler loads.*

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT



The "Buffalo" Type "BLH" Fan — broad performance characteristics — 86% mechanical efficiency.

The "Buffalo" Type "BA" Airfoil Fan — mechanical efficiencies up to 92%.

TO MATCH YOUR HORSEPOWER EVALUATION EXACTLY-

a complete series of "Buffalo" I.D. fans

Today's steam generation requirements are so varied and critical that no single type of mechanical draft fan can cover them all to best advantage. However, thanks to the complete "Buffalo" *series* of Fans, you can match fan characteristics to your requirements very closely.

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For systems where high efficiency over a broad operating range is of major importance, "Buffalo" Type "BLH" Fans offer stable performance and mechanical efficiency above 80% from 70% to 135% of rated volume. The "BLH" will operate at practically identical efficiency with either fixed or variable inlet vanes, for accurate volume without sacrificing fan performance.

Or where abrasive conditions exist, and where high-pressure, high-capacity characteristics could mean selection of a smaller (and lower-cost) fan, the "Buffalo" Type "CR" Radial Blade design merits your consideration. Besides inherent resistance to wear, it offers 76% static efficiency — plus a choice of three wheels for best performance under your pressures.

Write for Bulletins F-200, FD-205 and FD-106 for the one *complete* selection of Mechanical Draft Fans — "Buffalo" — known for the "Q" Factor, or *built-in Quality which provides trouble-free satisfaction and long life.*

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BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

AFTER 12 WEEKS' TEST: Untreated Wood. Severe fungus attack completely covers wood block resulting in disintegration and loss of weight.

Pressure-Creosoted Wood. Fungus all around but none on the test block. No disintegration—no loss of weight.

We feed fungus—so you can starve it

Pressure-creosoted utility pole removed after 22 years in the ground and still in excellent condition. No sign of rot, no fungus growth and no termite attack.

Fungus thrives on untreated poles buried in moist, warm earth . . . but it can't stand creosote. To find out the most effective way to protect utility poles, United States Steel conducts continuous research on the likes and dislikes of various fungi.

Results have been startling. In a 12-week test, untreated wood blocks exposed to fungus attack took on weird shapes and suffered a heavy loss of weight. In contrast, pressure-creosoted wood resisted the attack and kept its shape and weight.

Pressure creosoting not only stops fungus growth, it repels termite attack, and plain rot, too. In most areas, pressure-creosoted poles last from 25 to 35 years. Where else can you get such low-cost insurance?

For more information on the advantages and economies of pressure treatment and USS Creosote—the quality preservative—write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa., or call our nearest chemical sales office. Pressure-creosoted poles are available from treaters in most parts of the country. U. S. Steel supplies only the creosote.

"Creosote's past assures wood's future!"

Sales Offices in Pittsburgh, New York, Chicago, Salt Lake City and Fairfield, Alabama

USS Creosote

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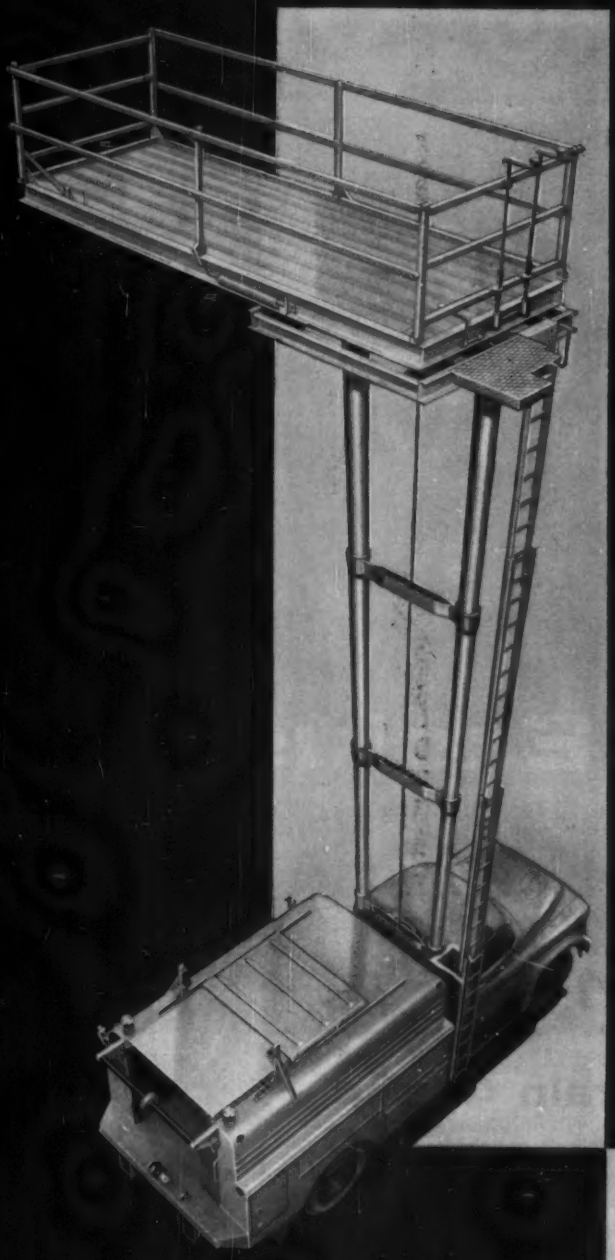

WORKSHOP WITH A 35 FT. REACH

POWERS-AMERICAN
HYDRAULIC AERIAL TOWER

There's 44 sq. ft. of work space on the insulated platform of the Powers-American Series TW-2 Hydraulic Aerial Tower. Plenty of elbowroom for the overhead crew plus tools and materials.

Two perfectly-synchronized powerful hydraulic cylinders do the lifting work . . . elevate the platform to any height, up to its maximum reach which enables the crew to work 35 ft. above ground. Dual controls permit operation of the tower from the platform or the truck cab. Platform can be rotated continuously in either direction . . . enabling the crew to reach work in an area of 250 sq. ft.—without moving the truck.

The work-speeding, cost-cutting advantages of the TW-2 Tower can be combined with a Powers-American Body that's just right for your particular operation.

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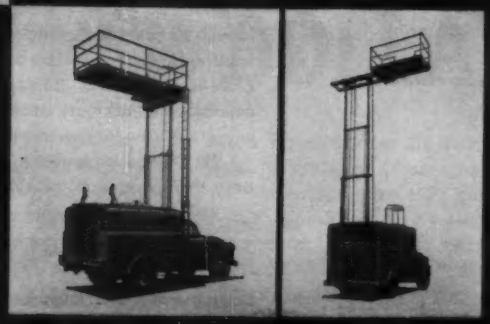

Series 7A-01 Tower (at left) is available in 21' and 25' models. Powers-American Towers can also be furnished with lateral-extending platform (at right), with stationary platform, or with special platform and operating features to meet your specific job needs.

Another reason why...
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Exclusive...

SD Dead End Strain Clamp

New . . . Anderson Electric's aluminum SD Dead End Strain Clamp with two exclusive features: keeper pieces are captured to U-bolts for quicker installation . . . no need to cut cable for insertion . . . no need to remove clamp bolts, nuts or keepers. Exclusive nose extension permits more stable seating of clamp nose at cable entrance into hot line strain carriers. Makes for easier maintenance of strain insulator strings.

SD Clamps are available in a wide range of cable sizes—.20″ to 1.55″. They are sold **only** through approved insulator manufacturers.

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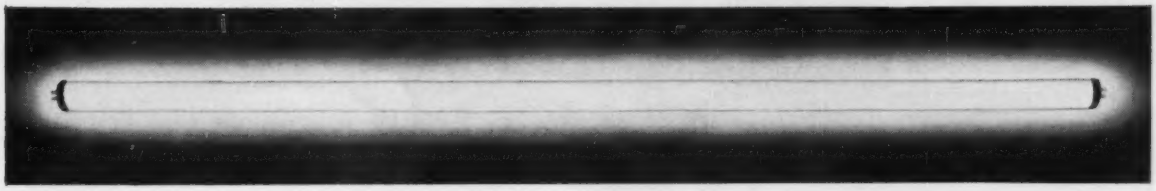

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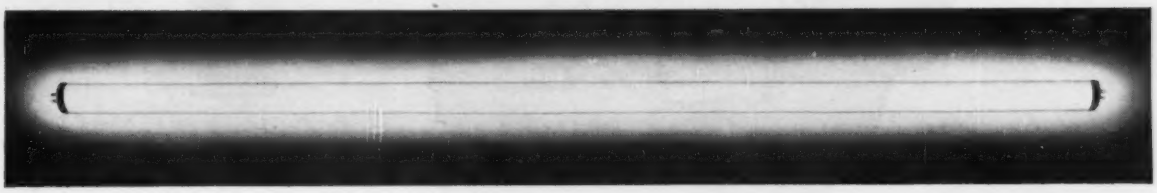
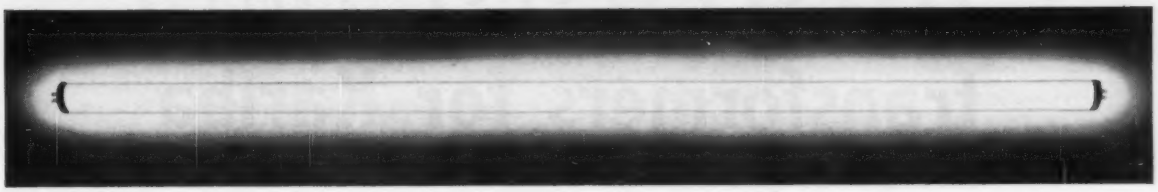


give you MORE LIGHT PER FOOT



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"ULTRALUME"™ phosphors coat the inside of every Westinghouse fluorescent lamp and produce the light you see. "Ultralume" phosphors assure maximum brightness for the life of the lamp. Only Westinghouse has "Ultralume" phosphors.

THAT'S WHY a Westinghouse lamp will give you more light at less cost . . . it takes as much electricity to light a "lazy lamp" as a Westinghouse. And a Westinghouse lamp has a longer brilliant life . . . more light per foot, more light per dollar.

ALL Westinghouse fluorescent lamps have "Ultralume" phosphors . . . there's one for every industrial, business and home use. Specify Westinghouse on every lamp order. Call your local authorized Westinghouse agent or write—Westinghouse Lamp Division, Bloomfield, N. J.

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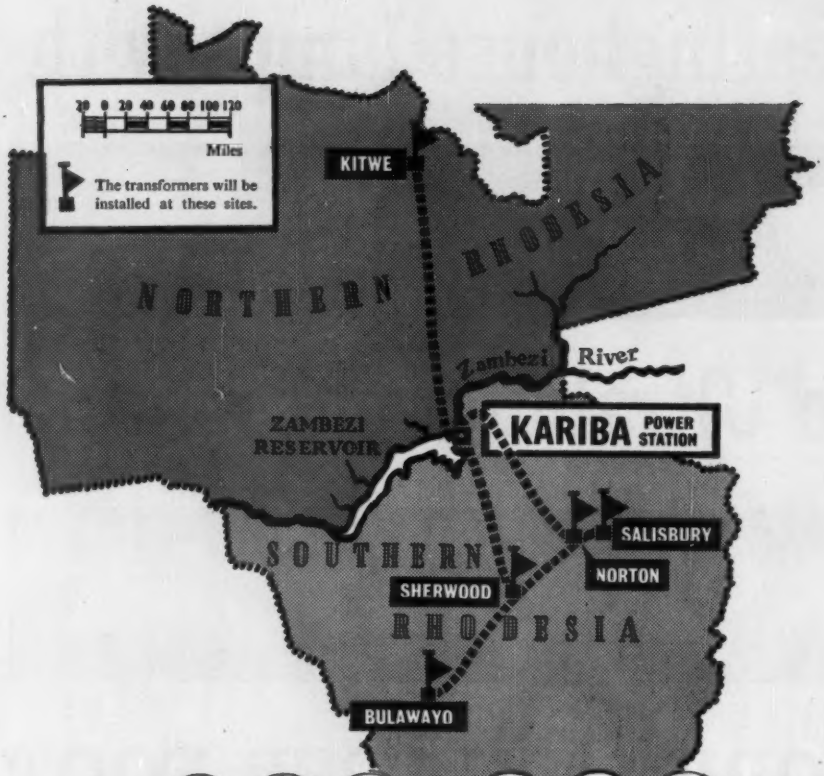

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330,000 volts

transformers for Kariba

The contract awarded to Ferranti Ltd. by the Federal Power Board for the great Kariba Hydro-Electric Scheme on the Zambesi River covers two 120,000 kVA 330/234 kV 3-phase auto transformers with separate boosters; eight 60,000 kVA 330/88 kV 3-phase double-wound transformers; and two 60,000 kVA 330/33 kV 3-phase double-wound transformers. All the transformers will be provided with on-load tap changing gear. The placing of this large and important overseas transformer contract emphasises the world-wide confidence in Ferranti Ltd. as builders of fine transformers.

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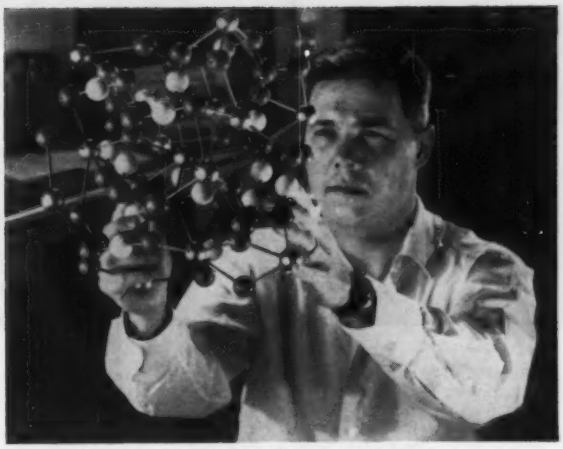
The question mark symbolizes man's inquiring spirit. And nowhere is this spirit cultivated with more enthusiasm than at Bell Telephone Laboratories where, through vigorous research and development, it constantly works to improve electrical communications and also to help national defense in essential military programs.

More than 3000 professional scientists and engineers at Bell Telephone Laboratories are exploring, inventing and developing in many fields: chemistry, mathematics and physics, metallurgy, mechanical engineering, electronics and others. You see the successful results achieved by this organization of inquisitive and highly trained minds in the nationwide telephone system that serves you.



Dr. Walter Brown, physics graduate of Duke and Harvard Universities, bombards crystalline solids with one-million-volt electrons to study the nature of simple defects in crystals. Objective: new knowledge which may help improve transistors and other solid state devices for new and better telephone and military systems.

Peter Sandsmark, from Polytechnic Institute of Brooklyn, and his fellow electrical engineers develop a new microwave radio relay system able to transmit three times as much information as any existing system. Objective: more and better coast-to-coast transmission for telephone conversations and network television.

Bill Whidden, from Polytechnic Institute of Brooklyn, and George Porter, from Georgetown College, study new experimental telephone instruments designed to explore customer interest and demand. Objective: to make your future telephone ever more convenient and useful.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

how to coordinate SMD Power Fuses for maximum protection

a case study using a new "step-by-step" technique

A common error in fusing the primary of a power transformer is the selection of a fuse of such a speed and ampere rating that the full protection capability of the modern fuse is not put to use.

Properly selected, a modern power fuse can provide for

1. system protection,
2. transformer protection against secondary faults, even line-to-ground,
3. use of transformer short-time daily overload capability,
4. use of transformer short-time emergency overload capability, and
5. complete and precise coordination with other overcurrent devices.

The selection of the right fuse, however, has not been easy, since there has been until now no commonly and consistently agreed upon method of coordination; and only meager information about fuse performance has been available.

Consequently, a new "step-by-step" method for power fuse coordination has been developed by S&C. Supported with all necessary power fuse performance data, this method utilizes the full protection capability of the *modern* power fuse; furthermore, it lends itself to general acceptance and universal use because its development was based on the realistic recognition of

1. the duties the user desires to impose today on a power fuse, and
2. the contradictions in power fuse selection work—the need for simplicity on the one hand and the need for precision on the other.

The case study which follows illustrates the new step-by-step method. It concerns the selection, specifically, of the proper SMD Fuse Unit for application on a power transformer primary.

• • • •

Case Data:

Transformer Bank:
7500 kva, 3-phase, self-cooled.
Primary voltage: 69 kv delta
Secondary voltage: 7.2/12.47 kv wye
Short Circuit Maximum:
Primary: 750,000 kva
Secondary: 80,000 kva (bus fault)

Secondary Breaker:
Ampere Rating: 1200
Reclosing Time: 10-40-100 sec.
Relay-breaker characteristic shown by curve, Figures D and G

Procedure:

Using the S&C Data Bulletin 262, open the front cover to the step-by-step outline shown in Fig. A.

Step 1: Select voltage rating of fuse to equal or to exceed line-to-line voltage of the system—69 kv.

Step 2: Check for adequate interrupting rating (Fig. B). Since the maximum available short-circuit is 750,000 kva, the correct fuse unit is SMD-2.

Step 3: Establish the minimum ampere rating of the fuse unit. In this case use the table for self-cooled or water-cooled power transformers (Fig. C). *(Similar tables are provided for forced-air-cooled power transformers and for potential and distribution transformers.)* The fuse unit ratings in this table have been selected to carry normal short-time daily overloads of the magnitudes established by ASA in the publication, "Guide for Loading Oil-Immersed Distribution Transformers and Power Transformers." No *additional* allowance need be made. Per Fig. C under the proper voltage (69 kv) and proper kva (7500), the correct fuse unit ampere rating is 100E.

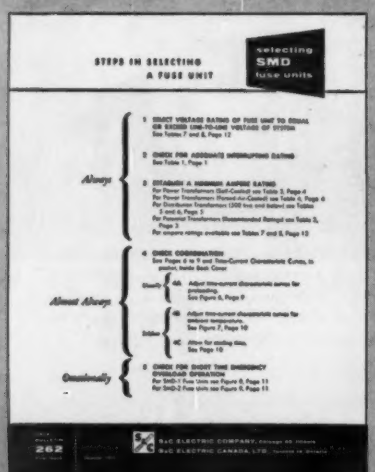
Step 4: Check coordination. Here are two ways: (1) Rule-of-Thumb Method (satisfactory in most cases) and (2) Precise Method (used when the Rule-of-Thumb Method apparently indicates that coordination is impossible).

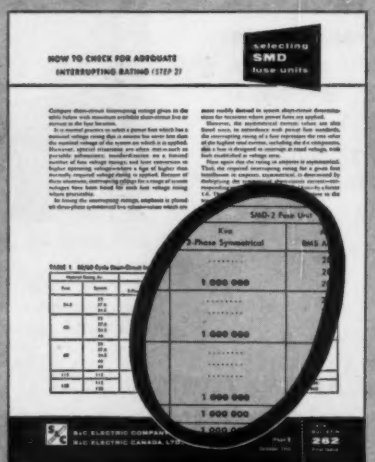
SECONDARY FAULTS—RULE-OF-THUMB METHOD, FIGURE D.

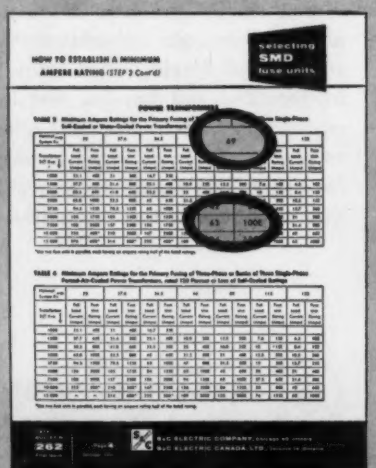
First: Establish the fault conditions under which coordination is to be checked and compute the fault current levels. In this example, a 3-phase secondary bus fault is assumed, resulting in a primary fault current of 680 amperes (see ① in Fig. D).

Second: At this fault current level, read from the time-current characteristic curve the minimum melting time for this fuse unit, 100E amperes—Standard Speed assumed. This gives Point ② in Fig. D 0.49 seconds.

Third: Multiply this time by .55—to give 0.27 seconds—thus establishing Point ③ a minimum margin between fuse and breaker-relay curves. The factor .55 makes allowances for variations in ambient temperature and for full pre-







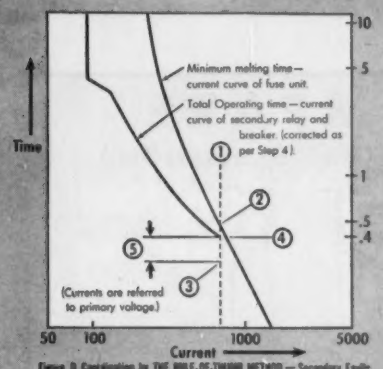
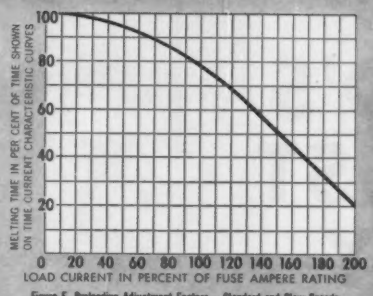


Figure D. Coordination by THE RULE-OF-THUMB METHOD — Secondary Faults


MELTING TIME IN PER CENT OF TIME SHOWN ON TIME CURRENT CHARACTERISTIC CURVES
LOAD CURRENT IN PERCENT OF FUSE AMPERE RATING
100
80
60
40
20
0 20 40 60 80 100 120 140 160 180 200
Figure E. Preloading Adjustment Factors—Standard and Slow Speeds

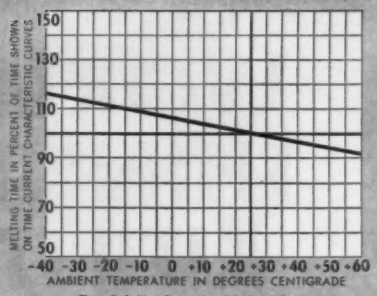


Figure F. Ambient Temperature Adjustment Factors

loading of the fuse, even from daily overloading of the transformer bank.

Fourth: Read from total operating time-current characteristic curve of secondary relay-and-breaker the operating time, Point ④ for this current level—0.40 seconds.

Conclusion: Coordination is not obtained since the time of Point ④ exceeds that of Point ③.

The next step is to recheck coordination, assuming a *Slow Speed* 100E ampere fuse unit. Here again, using the Rule-of-Thumb Method, coordination is not obtained. At this point, rather than to select a higher ampere rating which would sacrifice transformer protection, recheck coordination by the Precise Method.

SECONDARY FAULTS—PRECISE METHOD (an alternate to the Rule-of-Thumb Method), FIGURE G.

This method involves a comparison of the time-current characteristic curves of the selected fuse unit and the secondary breaker-and-relay *after both curves have been corrected* for the various factors that affect coordination. (See Fig. G below.) Factors for correcting relay and breaker curves are obtained from relay and breaker manufacturers.

The factors which apply to the fuse units are discussed below. They are:

- Adjustment for Preloading (see Fig. E above)
- Adjustment for Ambient Temperature (see Fig. F above)
- Allowance for the effect of cumulative heating and cooling of the fuse element during successive breaker operations (heating while short-circuit current flows, then cooling between breaker operations). Where the open-circuit time interval is less than ½ second, no allowance for cooling of the element is necessary; where the interval is 2 seconds or more (as it is in this case), the element will cool to a degree where cumulative heating need not be considered. (For intervals between ½ and 2 seconds, the full details on cooling time allowances are found in Data Bulletin 262.)

In this particular fusing problem, coordination with the secondary breaker-and-relay has been obtained by the Precise Method, since, in Fig. G, the time ② on the corrected fuse curve is greater than the total relay-breaker time ③ for this current level. This difference is indicated by ④. Were this not the case, using a Standard Speed Fuse unit, then a recheck would be made, using a fuse unit of the same ampere rating but Slow Speed. Do this rather than going to a higher ampere rating, since a higher rated fuse unit offers less protection to the transformer. If the Slow Speed does not coordinate satisfactorily, *then* recheck, using the next higher ampere rating in the Standard Speed.

PRIMARY FAULTS, FIGURE H.

For both Rule-of-Thumb and Precise Coordination Methods the same practice is used. No adjustments or margins are required. Coordination will be obtained where the total clearing time of the fuse unit ③ is equal to or less than the tripping time ② of the line breaker relay. ④ Indicates margin.

Step 5: Check for Short-Time Emergency Overload Operation.

These curves (Fig. I) show the ability of an SMD Fuse Unit to carry emergency overloads after carrying rated load. This overload situation arises, for example, when one transformer on a duplex substation is out of service for repairs or maintenance, putting the entire load on the other transformer and its fuses. The curves are based on an ambient of 30°C and represent the maximum *nonrepetitive* overload (in per cent of ampere rating) that an SMD Fuse Unit can carry for a given time without impairing its ability to perform properly. For each degree above or below 30°C, the capability may be adjusted 0.3 per cent.

• • • •

The above case study is a brief summary of a fusing problem solved by using the complete 12-page Data Bulletin 262 entitled, "Selecting SMD Fuse Units," published by S&C Electric Company. This bulletin with 8 Time-Current Characteristic Curves and a comprehensive text on coordination is yours for the asking.

S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto, Ontario.

S&C ELECTRIC COMPANY

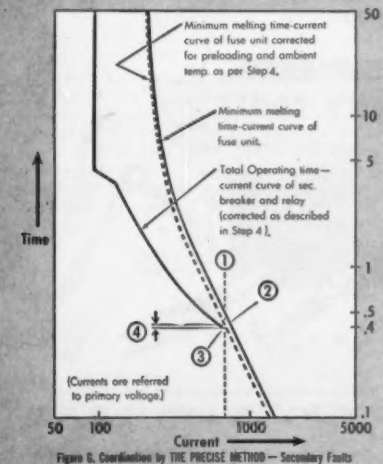


Figure G. Coordination by THE PRECISE METHOD — Secondary Faults

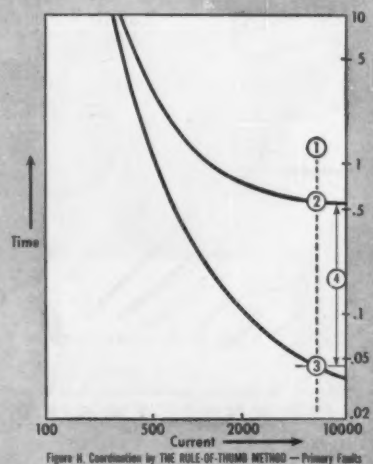


Figure H. Coordination by THE RULE-OF-THUMB METHOD — Primary Faults

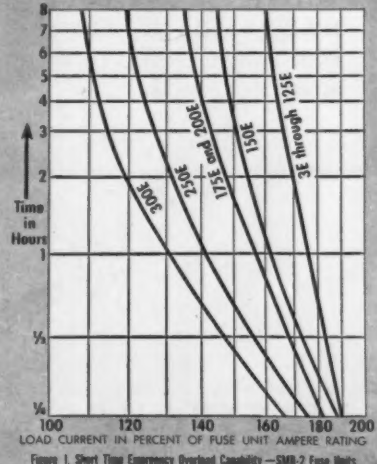


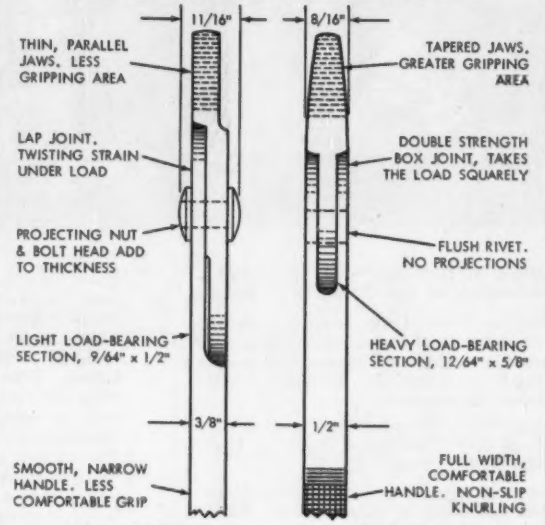
Figure I. Short Time Emergency Overload Capability—SMD-2 Fuse Units

WORLD'S THINNEST UTILITY PLIER

gets in and grips where no other tool will do the job!

"CRESTOGRIP" PLIER No. P210. Retails for $3.00. If your hardware dealer can't supply you, order from the factory, $3.00 postpaid.

COMPARE
THESE ACTUAL DIMENSIONS


11/16"
8/16"
THIN, PARALLEL JAWS, LESS GRIPPING AREA
TAPERED JAWS, GREATER GRIPPING AREA
LAP JOINT, TWISTING STRAIN UNDER LOAD
DOUBLE STRENGTH BOX JOINT, TAKES THE LOAD SQUARELY
PROJECTING NUT & BOLT HEAD ADD TO THICKNESS
FLUSH RIVET, NO PROJECTIONS
LIGHT LOAD-BEARING SECTION, 9/64" x 1/2"
HEAVY LOAD-BEARING SECTION, 12/64" x 5/8"
3/8"
1/2"
SMOOTH, NARROW HANDLE, LESS COMFORTABLE GRIP
FULL WIDTH, COMFORTABLE HANDLE, NON-SLIP KNURLING

COMPETITIVE LAP JOINT UTILITY PLIER

CRESCENT BOX JOINT UTILITY PLIER

Crescent's P210 Utility Plier is an amazingly versatile tool. Its unusual thinness, extreme strength and exceptional gripping power insure "pipe wrench" performance equalled by no other 12 ounce tool. The reason is illustrated in the sketch above.

No. P210 will grip flat, square, hex or round objects. Jaws are adjustable to four positions up to 1½" capacity. Rust resistant zinc plating. Retails for only $3.00

GET YOUR COPY!

Ideas and guidance for the professional and amateur mechanic. Forty pages of *help*... profusely illustrated. Proven ways of doing it easier with good hand tools. A new and revised edition of a "how-to-do-it booklet" that mechanics and industrial arts teachers by the tens of thousands have endorsed. Send 10¢ to cover postage, or GET A FREE COPY with the purchase of *any* CRESCENT TOOL. Ask your local hardware dealer. This offer is limited to the continental U. S. A. SEND A DIME TODAY! OR ASK YOUR HARDWARE DEALER FOR YOUR FREE COPY as explained above.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

MOLONEY "SELECT-AMP"

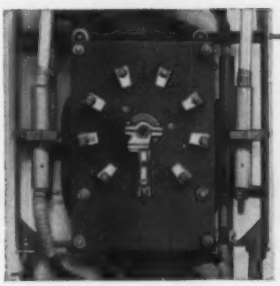
POLE TYPE STEP VOLTAGE REGULATORS

. . . provide an efficient, economical answer to your voltage regulation problems.

The component parts of Moloney "Select-Amp" Pole Type Regulators have the same carefully engineered, high quality construction found in all Moloney transformers. Here are some of the features of this regulator . . .

"Select-Amp"—The Moloney "Select-Amp" feature is controlled from the position indicator and allows the range of voltage regulation to be adjusted from a maximum of plus or minus 10% to a minimum of plus or minus 5%. Reducing the range of regulation to plus or minus 5% permits increasing load current to 160% of normal rating. The voltage is raised or lowered in ⅝% steps.

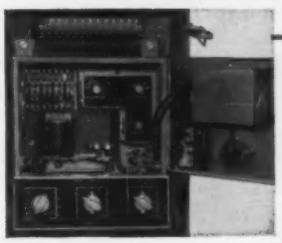
Position Indicator—is directly coupled to the drive mechanism. Resetable drag hands on the position indicator indicate the highest and lowest position the regulator has reached. These drag hands may be reset by operating the reset lever with a hook stick. The position indicator is mounted at an angle to facilitate observation of indicator from the ground.



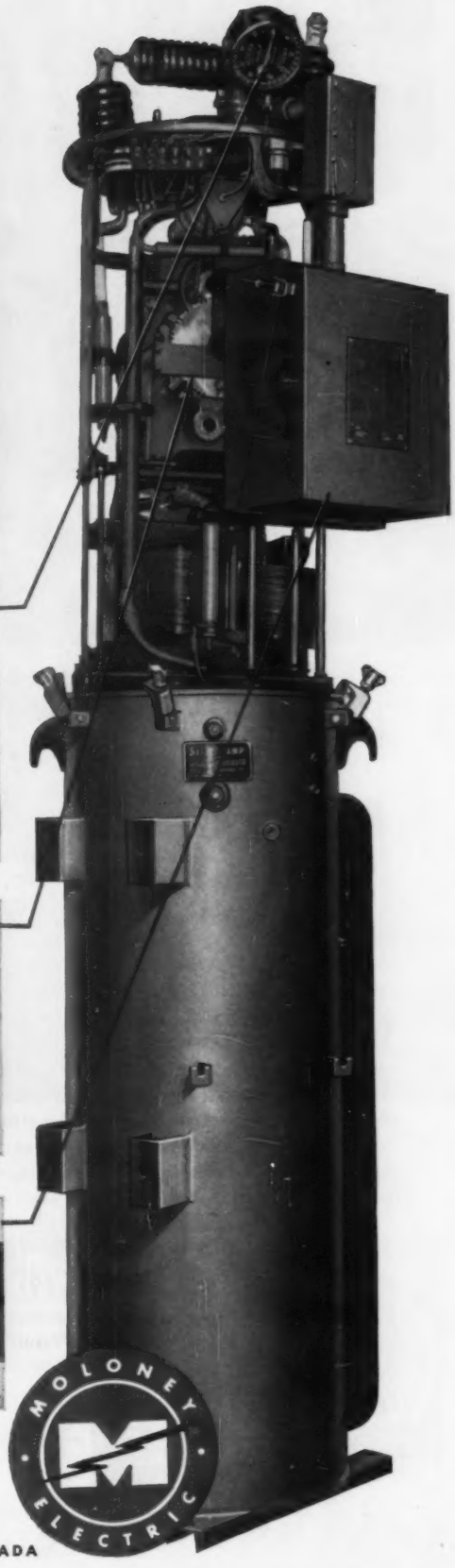
Moving Contact Assembly—consists of arc-resistant copper tungsten contacts contained in beryllium copper clamps, aligned with beryllium copper springs and compressed with coil springs to obtain correct contact pressure. A spring loaded accelerator provides "quick-break", "quick-make" action to all switching, thereby minimizing arcing time, consequently reducing contact wear.

Stationary Contact Blade—is made of copper chrome alloy and is tipped with copper tungsten to minimize arc erosion.

Mounting Panel—is made of heavy bakelite to provide an insulating panel for mounting the switch contacts.



Control Cabinet—The hinged front cover is gasketed and is secured by toggle clamps thereby affording both weather-proofing and accessibility. The toggle clamps are provided with padlock eyes so that the cabinet may be locked to prevent tampering. The cabinet is bolted to brackets on the tank wall and may be removed for mounting at the base of the pole.



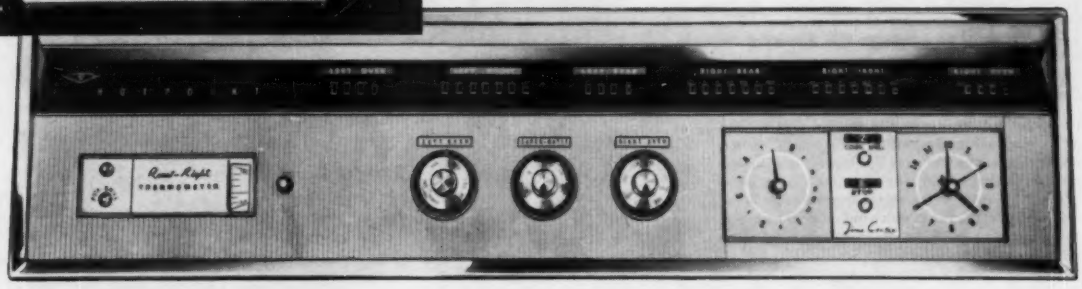
MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Hotpoint ELECTRIC RANGES

have the Difference
that builds load
and revenue...
automatically!



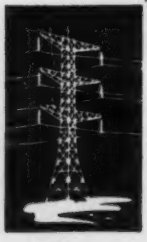
Hotpoint Electric Ranges help you build sales, load and revenue with all of the brilliant advances in quality, styling and completely automatic operation that make up the Hotpoint Difference. For example, the distinctive new control panel above provides automatic command of all surface and oven units—both time and temperature—at the touch of a button.

There's an exclusive new "thawer oven" that thaws frozen foods faster, doubles as a surface baking unit. And a new "touch open" storage drawer that glides out in response to a touch of the toe or hand. An exclusive accurate meat thermometer in the Super Oven, controlled with one simple setting, signals when the roast or fowl is done just right.

These imaginative, yet practical advantages are just a few samples of the sale-exciting features offered by the dramatic Hotpoint Difference. Hotpoint Ranges will help you put more POWER in "House-Power"—more LIVING in "Live Better—Electrically!"

Ask your Hotpoint Distributor to show you the Hotpoint Difference in the 5 NEW 39-inch models and the 3 NEW 30-inch models for 1958!

LIVE BETTER ELECTRICALLY



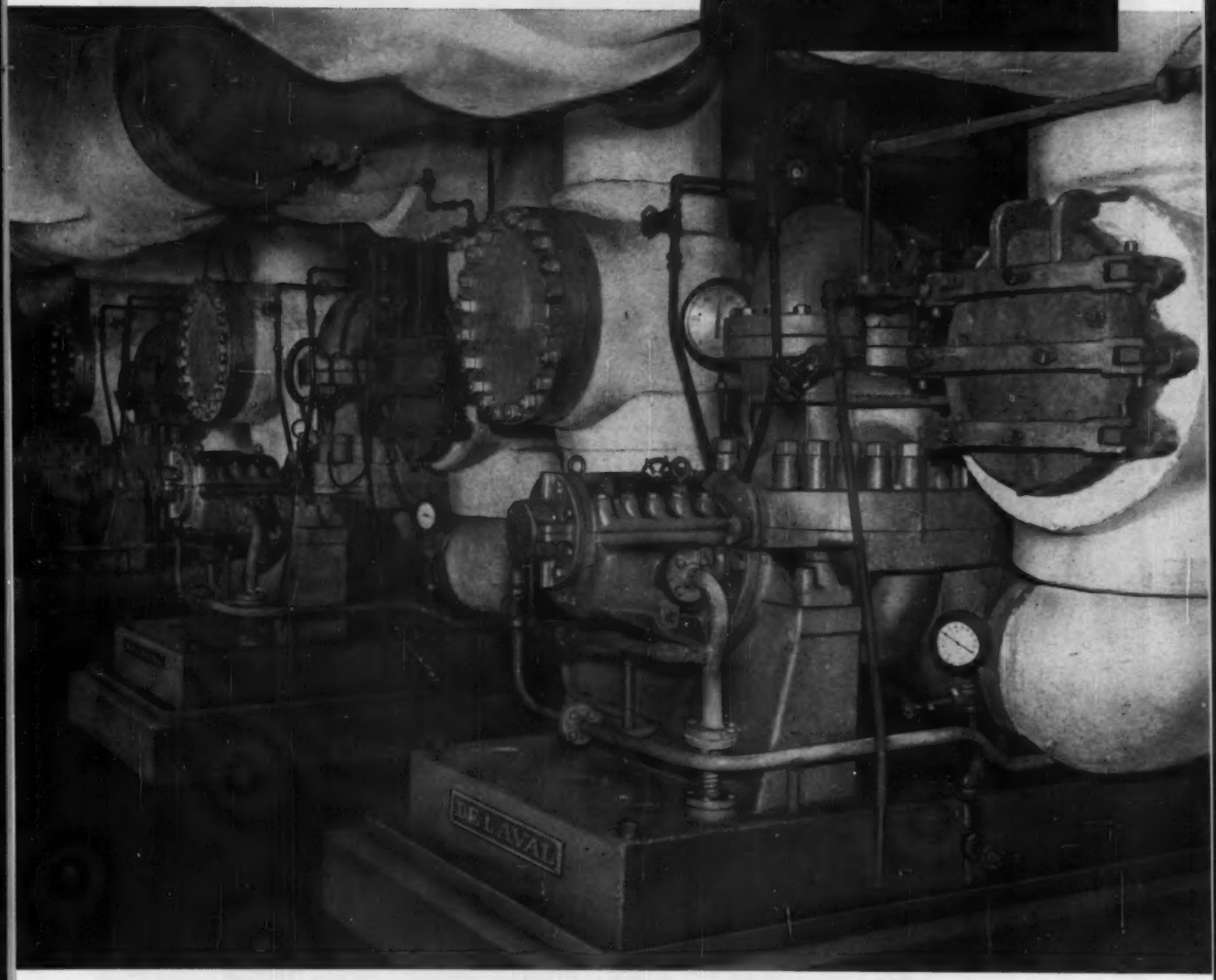
LOOK FOR THAT Hotpoint DIFFERENCE

(your customers do!)

Con Edison *reorders*

DE LAVAL

BOILER FEED PUMPS



The three De Laval Oppeller Pumps, shown in the photograph, do a dependable job of handling boiler feedwater at the East River Station of the Consolidated Edison Co. of New York. These three-stage pumps, with double-suction in the first stage, have a capacity of 2,000 gpm and operate at a discharge pressure of 620 psig. As proof of their reliable performance, Con Edison has ordered two identical units for the expansion of this station *plus* similar pumps for their Indian Point nuclear generating station.

Excellent for *medium* pressure and temperature service, De Laval Oppeller Pumps are designed with opposed impellers that balance axial thrust. Standard design features include sleeve bearings and labyrinth wearing rings which assure long economical service.

For *high* pressure, *high* temperature boiler feed service, De Laval offers the barrel-type pump . . . a single-suction, radially split diaphragm type multi-stage pumping unit inside a forged steel barrel.

For more data on these dependable pumps, write for Catalogs 1502 and 1506

DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY

861 Nottingham Way, Trenton 2, New Jersey

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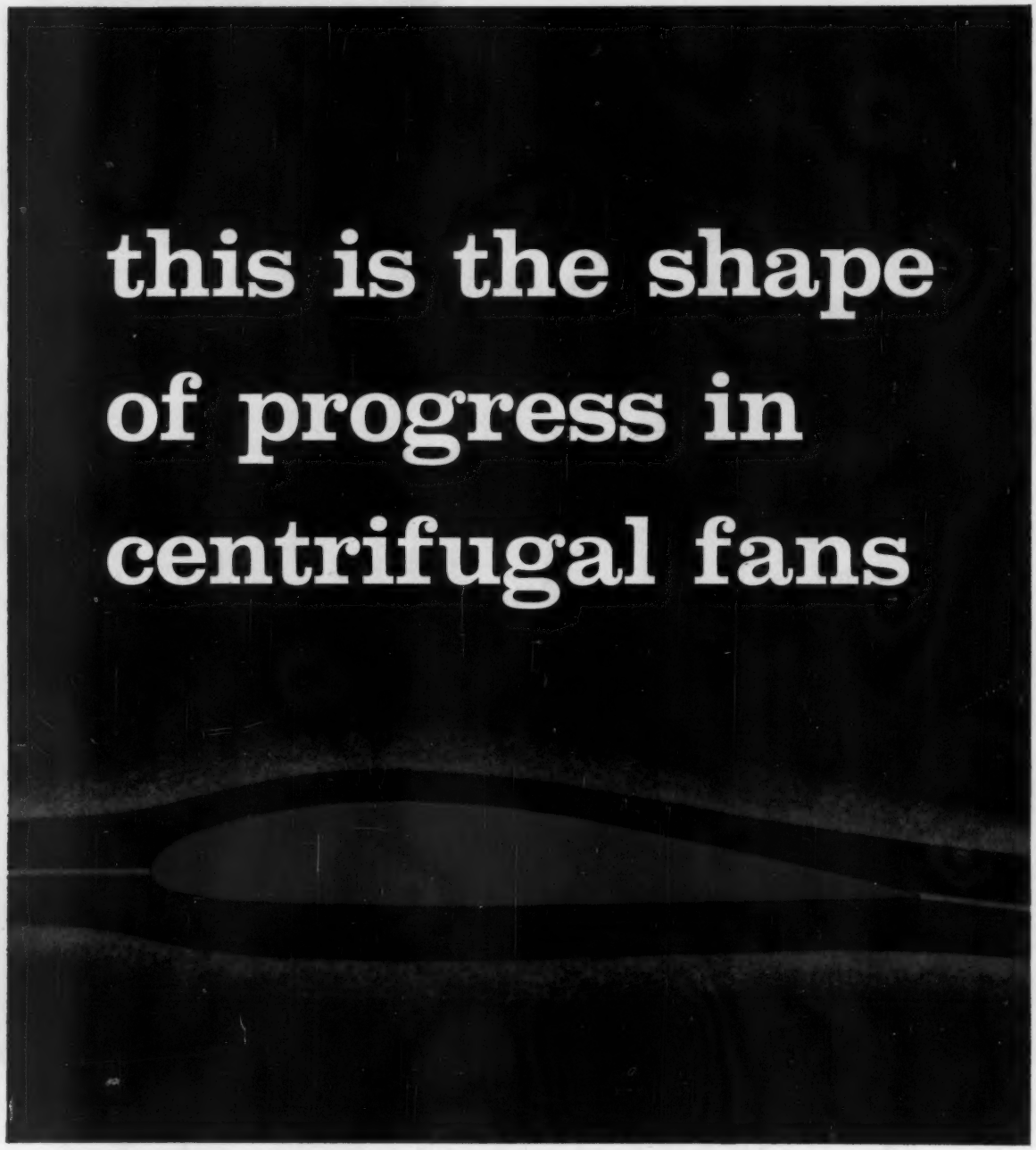


Westinghouse Airfoil Blading, the last word in centrifugal fan design, provides efficiency and quietness in mechanical draft applications.

With these advantages:

- Quiet Operation
- Lowest Operating Costs
- Stable Pressure
- Non-Overloading Feature

Available with Airfoil Blading:

Primary Air Fans
up to 40,000 cfm . . . . . up to 65″ pressure
Combustion Air Fans (High-Pressure Forced-Draft)
up to 350,000 cfm . . . . . up to 90″ pressure
Combustion Air Fans (Standard Mechanical Draft)
up to 700,000 cfm . . . . . up to 40″ pressure

More Information?

Call your nearest Sturtevant Division Sales Engineer or write Westinghouse Electric Corporation, Dept. D-16, Hyde Park, Boston 36, Massachusetts.

J-80667

YOU CAN BE SURE...IF IT'S
Westinghouse

SANGAMO CLASS 200 P2S **ACCURATE·ECONOMICAL**

A CLASS 200 POLYPHASE METER

in your *standard singlephase cover*

IMPROVED LOAD CHARACTERISTICS. P2S Class 200 Meters start at ¼% of rated load and provide accurate measurement to 666⅔% of rated load. This means that you can *accurately measure loads from 18 to 96,000 watts* with Type P2S Class 200 Meters.

GREATER OPERATING ECONOMIES. One meter, the 240 volt P2, can be applied to 120/208, 240/416 and 277/480 volt network systems, also to 3-wire 3-phase, and 3-wire singlephase circuits *without special calibration.* Accurate registration is obtained from 42% to 125% of rated voltage.

All Type P2 Polyphase Meters have been substantially reduced in height. The cover, interchangeable with the singlephase metal base socket meter cover used for the past twenty years, can be readily replaced from your existing cover stocks.

STABILITY. P2 Meters give sustained accuracy because of Sangamo's precise factory calibration... skillful design... careful selection of materials ...and rigid control of manufacturing processes.

SLOW SPEED. The advantages of slow disk speeds, proved so well in the Sangamo J2 Meter, have been incorporated to an even greater degree in P2 Meters. Reduced current and potential damping provides *greater inherent accuracy.*

* * *

The complete line of LIFETIME GUARANTEED Sangamo Type P2 Meters will handle all polyphase measurements.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM58-4

Here's why Wagner Form W Transformers are

EASIER TO INSTALL... GIVE LONGER SERVICE LIFE

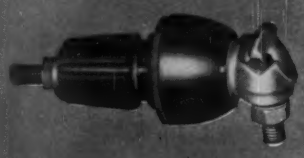
The small size and light weight of Wagner Form W Transformers makes them easy to handle—easy to mount on poles. Smooth, rounded lifting lugs—chuck type terminals with insulated hand knobs—key-locked bushings all combine to make installation easier.

These transformers give longer service life because of their liberal design that gives excellent electrical performance with high overload capacity to handle peak loads—their air-tight cover seal that prevents oil contamination—their electrically welded tanks and durable paint finish.

A few of the features of these modern distribution transformers are shown below.

HIGH VOLTAGE SIDEWALL BUSHING

Permits faster, safer connections because chuck type terminal eliminates need for tools, and insulated hand knob protects lineman when tightening terminal. Takes either copper or aluminum conductor. (Used on transformers 5 KV and below.)

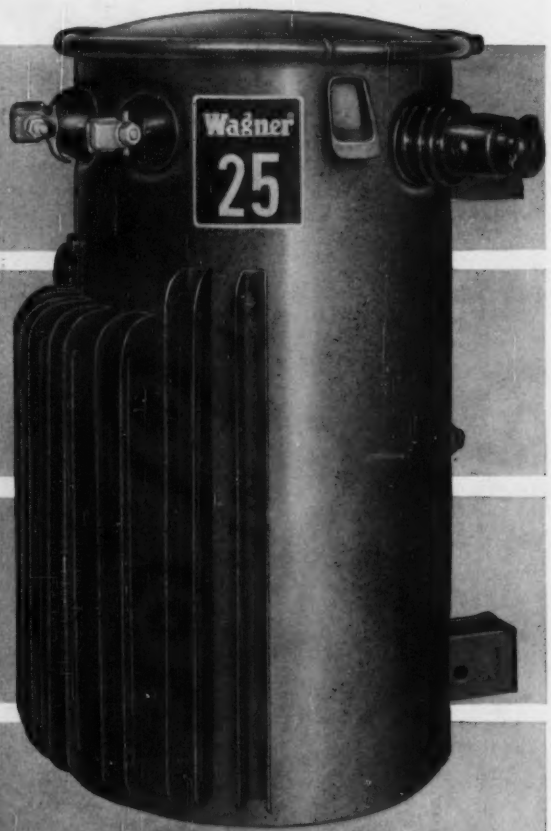


LOCKED LOW VOLTAGE BUSHING

Bushing and terminal are double locked to prevent slipping or turning when terminals are tightened. No loose inner terminal connections to cause short circuits.

SHUR-SEAL COVER CLAMP

Seals tank cover airtight . . . no atmospheric moisture or dust particles can get inside to contaminate oil and shorten transformer life. No oil can leak out during shipping or handling.



FORM W ELEMENTS

Cores of cold rolled oriented grain transformer steel are assembled through and around the pure copper coils. Thermo-setting insulation bonds coil element into a solid unit, which is braced to prevent any possibility of shifting.

Wagner Form W Transformers are available in single-phase ratings, 500 kva and smaller, 69 KV and below, in conventional or protected types. All ratings from 3 to 167 kva, 15 KV and below, are designed for pole mounting.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

WT58-3

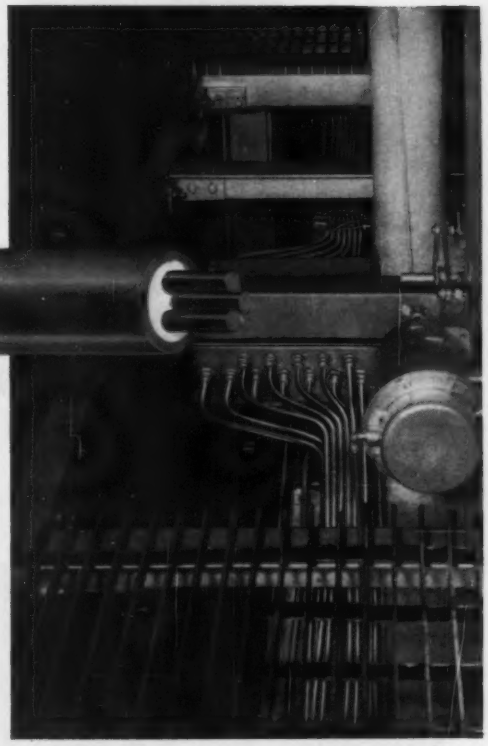
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

SAFETY m.i. CABLE

the answer to industrial power wiring...



- SPACE SAVING
- Time saving
- Permanent
- INSTALLED EASILY
- Fast power wiring to cut down-time

More and more General Cable's Safety MI 600 Volt Wiring System is being used because it can take the abuse of industrial application, giving trouble-free operation and unexcelled performance under the most severe conditions. Particularly adaptable in hot and wet locations. Available in 1, 2, 3, 4 and 7 conductor for power and control circuits.

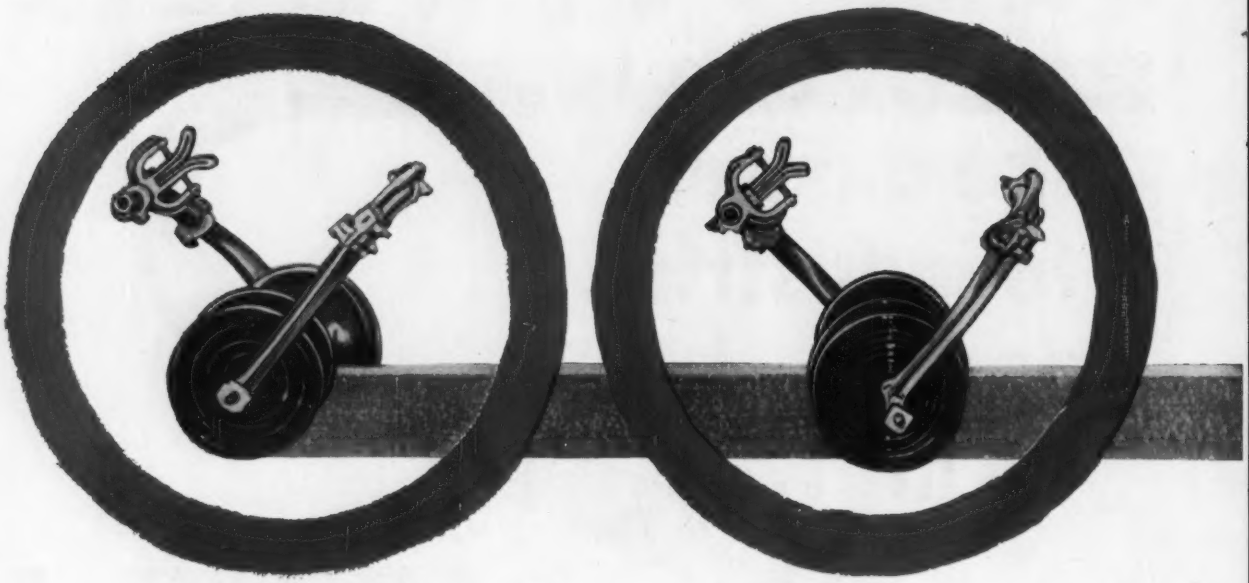
MI terminating in main Japan Oven control center switchboard at Poinsett Lumber and Manufacturing Company, Anderson, S.C.

Ask for a Demonstration To-Day!

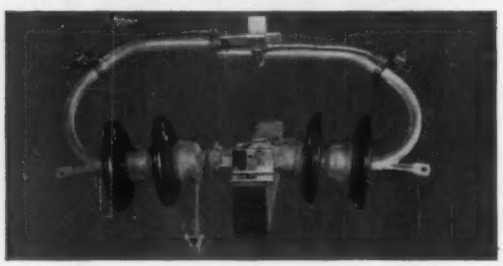
GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.
Offices and Distributing Centers Coast-to-Coast

for quality and service...specify GENERAL CABLE

This "look" on a pole



The original "straight-through" airbreak switch—proven in 50 years of system service



There's no mistaking the exclusive, clean, functional appearance of KPF switches. Their pleasing appearance derives from their simple design—simple design that assures you operating ease in all weather. There are no complicated mechanisms to malfunction, freeze, lock, need lubrication or wear out.

For 50 years, KPF switches have proved their trouble-free service advantages to major power companies. Why not make a test installation on your own lines; see for yourself. More and more companies are. Why not do it this month?

KPF

Write direct for catalog.

means KPF

Some practical reasons for buying KPF Switches

- simplest switches made; trouble-free
- simple manufacturing means lower cost
- no extra dead-end insulators
- installation time half normally needed
- easily installed on hot lines
- install in the air or on the ground
- needs no servicing, year after year

KPF
AIR BREAK
SWITCHES
Standard for nearly half a century

KPF ELECTRIC COMPANY
Dept. E. 1624 E. Alpine Avenue
Stockton 5, California

4265

ALL IN A DAY'S WORK AT *Pittsburgh Piping*

THE FIRST PIPING FOR ATOMIC POWER

Fabricated section in foreground is austenitic steel piping—the first fabricated for the world's first big atomic-power central station. Other components of this system are shown at the right.

This piping is a record maker—being the first ever made for a big atomic-power plant—the Duquesne Light Shippingport station. This job, while challenging, was facilitated by employing the techniques which we had previously developed for fabricating austenitic steel piping for central stations operating at steam temperatures of 1050°F. and higher, as well as for the *Nautilus*. In fact, Pittsburgh Piping was among the first to fabricate stainless steel piping—for the process industries, in 1927. And, we pioneered the use of stainless steel piping materials in the power field. We have the experience and the facilities—use them on your high temperature, high pressure piping jobs.

FREE TECHNICAL BULLETIN ON PIPING MATERIALS

This bulletin reports an intensive investigation into the problem of main steam piping materials and gives data on the stress rupture characteristics of Types 316 and 347 stainless steel piping adjacent to welded joints.

PP-33

Promoting Progress ***IN POWER AND PROCESS PIPING***

Pittsburgh Piping **AND EQUIPMENT COMPANY**
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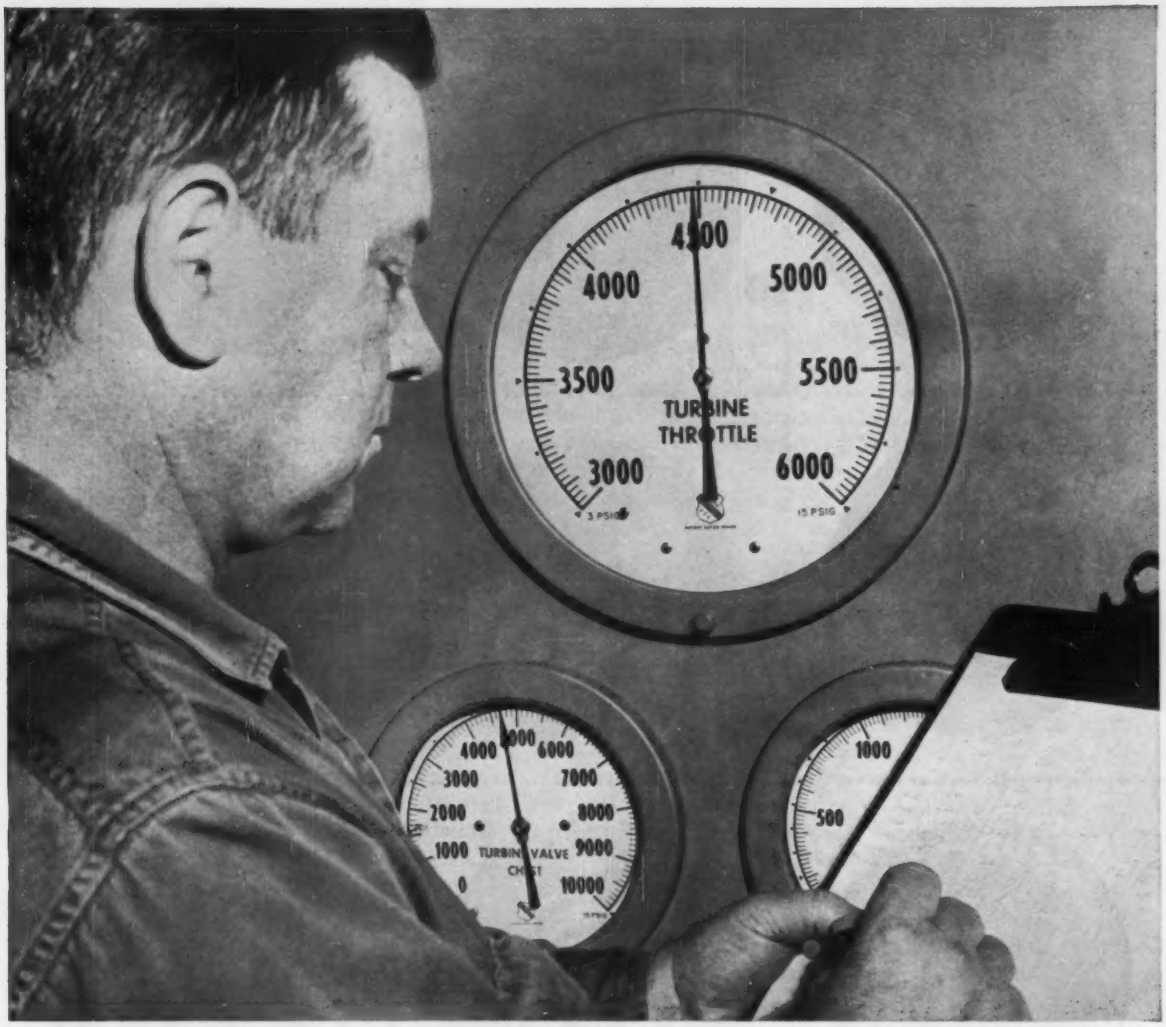

Top gauge shows steam pressure of 4500 pounds per sq. in. for turbine No. 6 at the Philo plant of Ohio Power Co., an operating company of American Gas and Electric Company.

New "super-pressure" steam unit requires ultra-pure water

• The higher its temperature and pressure, the more work steam will do for each pound of fuel you use. That's why power-plant steam pressures have been steadily climbing. First "super-critical pressure" unit is No. 6 in the A. G. & E. System's Philo Station. It operates at the tremendous pressure of 4500 psi (almost double previous "highs") and at a new high temperature of 1150°F.

At this pressure, it requires pumps with giant 5000 hp motors, each with the power of 2 freight locomotives, just to force water into the "boiler." In fact, the water doesn't even boil or bubble; it just flashes over to an invisible gas. And at 1150°F, the steam is hot enough to melt aluminum. Steam pipes to the turbine actually glow red under their insulation!

At Philo it is especially important to treat feedwater to remove dissolved solids that form scale and cause expensive damage. Unlike ordinary boilers, Philo's No. 6 has no drum in which dissolved solids can be concentrated and blown off. *All* the feedwater is flashed to steam . . . *any* solids would deposit in the boiler tubes or turbine.

To prevent these problems, the water for No. 6 unit is treated with a Permutit Demineralizer that reduces solids content to an average of 1/10 part per million!

You may not need water 99.99999% pure for your power, process or service requirements, but Permutit experience can help you find the right treatment for your job at the right price. Write for details to The Permutit Company, Dept. EW-4, 50 West 44th Street, New York 36, or Permutit Company of Canada, Ltd., Toronto 1, Ontario.

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a division of PFAUDLER PERMUTIT INC.
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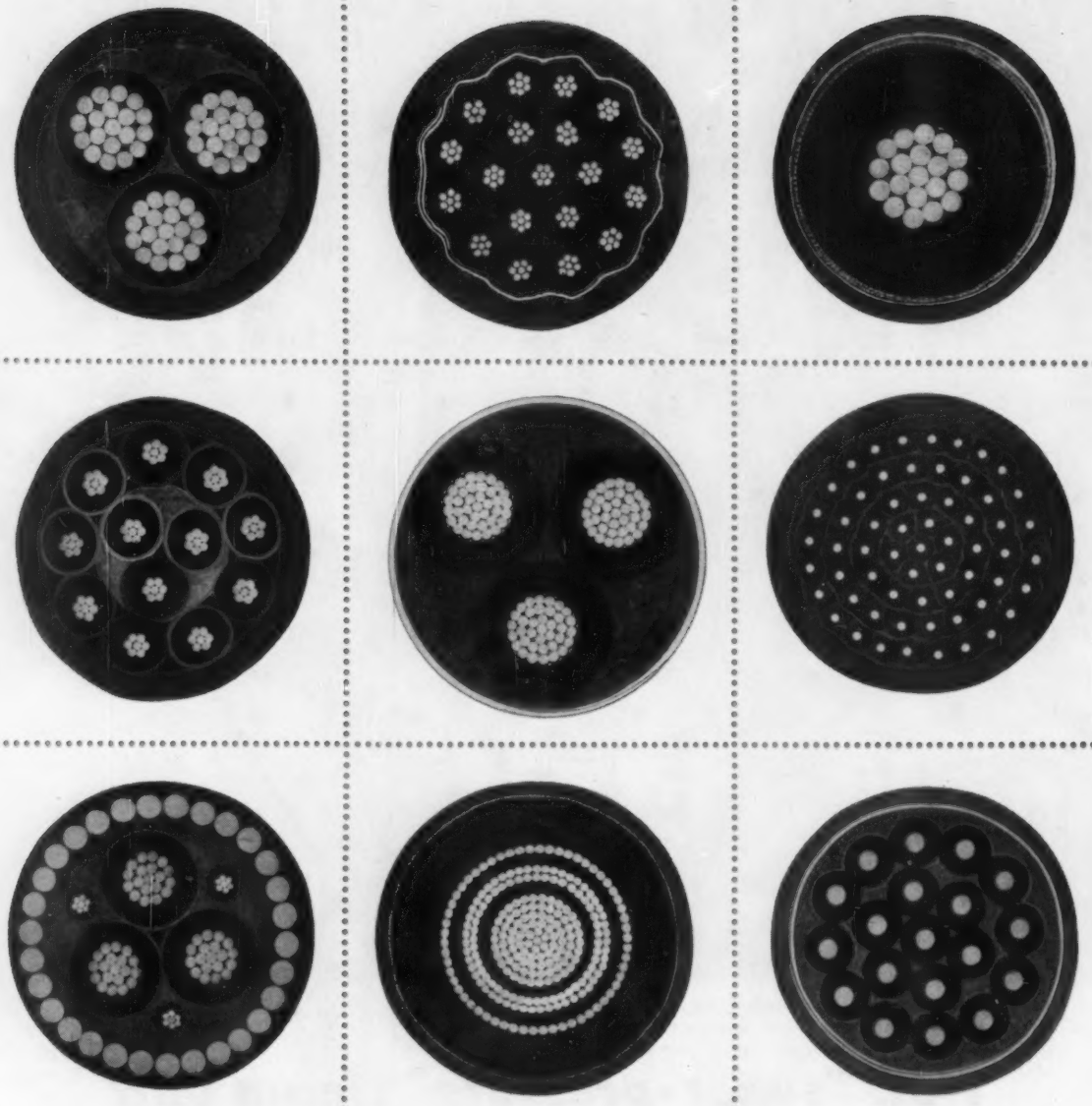


if *you buy cable...*

—take advantage of the unique properties of Kerite insulation. Let a Kerite engineer explain why no other cable can equal Kerite's performance in actual service, dependability, and long-time economy. Kerite cables are designed for a variety of applications and operating conditions, and are available in forms and finishes best adapted to your requirements. Be sure. Specify Kerite.

Our headquarters is at 30 Church St., New York 7. Branches in Ardmore, Pa., Boston, Cleveland, Chicago, Houston, San Francisco, Glendale, Cal.

KERITE CABLE

it's the **KERITE** *that makes the difference*

Editorial Comment

APRIL 28, 1958

Never Thought I Would Live to See the Day When the President of EEI Would Say . . .

"I firmly believe that we should view electric house heating as a principal means by which our rate of growth can be dramatically increased." This is the statement of Edison Electric Institute President J. W. McAfee, before the annual Sales Conference in Chicago.

We are delighted to find that the president of the Institute now gives attention to this subject, which committees have too often avoided and many members have ignored.

McAfee went on to say, "I would like to recommend to all of you for your very serious consideration two fields in which there has been a lot of discussion and woefully small accomplishment. The first of these is electric house heating and the other is lighting."

On a related subject, McAfee said, "I view promotion of the room heat pump as a tactical necessity right now to balance the inroads of room cooling on load factor."

We hope that this statement by McAfee will discourage some of the diverting searches for stored heat and other will o'-the-wisps. We are hopeful that the forceful statement by the EEI President will provide the leadership necessary to make EEI a prime mover in the trend toward electric house heating.

We Agree—Women Are Very Important!

Statistics to prove this obvious-to-us-all statement are being circulated within the industry. Here is the list:

More women vote than men.
They outnumber the men by 2 million in U.S.
They own 51% of the stock of all corporations.
They own 74% of the new homes, 40% of all homes.
They make 85% of all the nation's retail purchases.
They influence 85% of all consumer buying in the U.S.
They own ½ shares in AT & T, GM, U.S. Steel, and 40% of all RR.
They own 65% of all assets in mutual savings banks.
They file 45% of all income tax returns.
They influence the decision of 90% of all car sales.
They influence the decision of 62% of hardware sales.
They influence the decision of 77% of sporting goods sales.
They receive 70% of estates left by men.
They are beneficiaries of 80% of all private life insurance.

The listing ends with this comment: "We men may earn it—but women decide what to do with it—maybe this is our audience?"

Well, if they control America's corporations and make 85% of all the nation's retail purchases, that is all we need to know. Women are very important. May we also add the fact that they make sound decisions. For this reason we can be sure they will want all electric living including heating and cooling if given the opportunity.

The tide is changing fast as shown by the step-up in promotion of electric house heating by more and more utilities. Women provide the right audience. Let us see that they get the right information.

How AEC Licensing Is

Big job of laying down reliable safety criteria is in hands of Harold L. Price (left) and his 100-man staff

The power industry, as it enters the era when more new generating capacity will be atomic, faces a dilemma:

Nuclear plants must be safe, everyone agrees, but if atomic power is to become competitive, costs can't be inflated by building in more safeguards than are needed. But how much is enough?

A large share of responsibility for answering the question and thus directing the future of atomic power lies in the hands of Harold L. Price, who heads the Atomic Energy Commission's Division of Licensing and Regulation.

No one can put a reactor into operation without convincing Price and his 100-man staff that danger to the public is at a bare minimum.

The trouble is this: Nobody—in or out of AEC—knows enough about the hazards at this stage of the game to lay down reliable safety criteria. The commission and the industry must feel their way while experience is gained.

This, of course, poses the danger of delays from government red tape. Price says this won't happen.

It is natural that some nervousness surrounds the idea of taking a material which can lay waste a city and installing it in a power plant close to centers of population. The British experience at Windscale, where radioactive material was loosed on the countryside, shows that the fear has some foundation.

The AEC says flatly that "reactors cannot under any circumstances produce a bomb type of explosion." No deaths or significant injuries have resulted from operation of reactors in America. Still, the commission recognizes the possibility that ashes from an atomic furnace conceivably could be released.

Accordingly, the U. S. has met the problem in two main ways:

- Under the Atomic Energy Act of 1954, Congress created a regulatory framework under which licenses are required of any person building or operating nuclear reactors, or certain types of chemical processing and isotope separation plants.
- By an amendment adopted last year, Congress offered financial indemnity up to $500-million to licensed operators of reactors and certain other facilities.

Two Functions: Safety and Security

Price explains that the licensing program has only two functions—to provide for public health and safety, and to protect national security.

The commission first formalized its regulatory procedures in March, 1956. It issued rules under which AEC license cases are carried on much the same as cases at the Federal Power Commission and other agencies covered by the Administrative Procedures Act.

Last fall, however, Congress passed a law imposing even stricter rules on AEC licensing cases—namely, making mandatory at least two public hearings, where one is enough in other regulatory bodies.

Price explains the steps involved:

- The utility files an application for a license, including all developed details of design and construction.
- AEC, after reviewing the application and requiring any necessary changes, serves public notice of its intention to grant a construction permit. In the case of power and test reactors, a public hearing is then mandatory whether or not an objection is filed. For research reactors, hearings are held only on demand.

Prior to passage of the law last fall, hearings were permissory rather than mandatory. Hence hearings were not held on construction permits issued prior to that time. However, hearings will be required before final licensing in such cases.

To get a construction permit, the application must show financial responsibility, and the safety of the reactor's design and the location.

Although the decision is made by AEC, it considers advice of the Advisory Committee on Reactor Safeguards, a group of scientists formed in 1947 and given statutory recognition only last year.

The committee reviews each application and submits a report, which becomes part of the record.

- Once the construction permit is granted, the prospective licensee must get commission approval for any changes. Where a significant safety factor is involved, interested parties may demand a hearing into the change.
- When the plant is completed, the company must come in with its hazards summary **1.** Presenting its best technical opinion as to what events could possibly take place which would release radioactive materials, **2.** Telling what counter measures have been taken to minimize this danger, **3.** Outlining steps taken to contain and isolate any such discharge of radioactive matter, and **4.** Assessing plant location.

The final report is reviewed again by the reactor safeguards committee, and by the AEC staff.

- Then public notice is served that the commission intends to license the facility for operation. Again, a public hearing is mandatory for power and test reactors, but held only upon demand for research reactors. If no overriding objections are raised the license is granted.

Hearings are held before a trial examiner, whose intermediate decision is subject to AEC review.

AEC hasn't actually hired its own examiners yet. However, it is in the process of interviewing applicants.

Congress, anxious that a strong corps of examiners be built, has extracted promises from AEC that the examiners will be separate from the licensing division and fully independent in their decisions.

Evolving in Today's Experimental Stage

Admittedly, this whole procedure is complicated. And Price admits it is even more tedious than it sounds.

The problem is this: At this stage of the art, no two reactors are the same. Even reactors of one type—such as the boiling water—contain sufficient differences to require a long hard look at each one.

In fact, there is so little standardization in power reactors that the licensing division has not even evolved a standard application form. And, as Price says, "I don't know when we will have one."

"When these people come in, they don't know for sure whether they're going to build a Ford or Chevrolet, so to speak," adds Price. "They just have to work it out with us as they go along."

Since the initial application lacks sufficient detail, it is supplemented after extensive correspondence and personal visits among company and AEC staff experts.

After the construction permit is granted, AEC still must follow the project, okay any changes in design, and be ready to pass on the application for an operator's license.

Even after the operator's license has been issued, there may be changes in core loading or other design details that need approval.

Complex Steps Aren't a Drag

Despite the complexity of the procedure, Price does not believe it has delayed construction significantly.

"Most of the companies aren't ready to build anyway, when they first come in," he notes. However, Price faces a growing workload.

License applications for construction and operation of test and research reactors increased from 19 in 1956 to 44 last year. Export license applications, also handled by Price's office, tripled in 1957.

In the power reactor field, the commission issued 22 permits to construct nuclear facilities in 1957, five amendments to construction permits, 34 licenses to operate nuclear facilities and 18 amendments to operating licenses.

Price agrees there is a backlog—but it is hard to pin down how much is true backlog and how much is simply a case of marking time while technical problems are ironed out.

The length of the delay before an applicant gets his construction permit depends on the size and complexity of the reactor.

Massachusetts Institute of Technology, for instance, sought a permit in 1956 for a 1,000-kw heavy water research reactor. The school came in with its final hazards summary report in December, 1957, and is now getting its license.

Commonwealth Edison Co applied for a construction permit for its 180,000-kw Dresden plant in April, 1955, and didn't get it for 13 months.

To questions of what will happen when applications for atomic plants begin showering in, Price is confident that the problem will work itself out. The process is necessarily slow while the industry is in an experimental stage but standardization will speed up procedures, he says.

Meanwhile, however, Price is hopeful that AEC will be able to evolve this year a set of reasonably reliable, though broad, criteria so applicants will know better what is expected of them.

The licensing division has come under little fire from Capitol Hill. Rep. Chet Holifield (D-Calif.), powerful member of the Joint Committee on Atomic Energy, believes the regulatory job eventually will become so great that it should be broken off from AEC completely and put in a separate agency. But no push is expected to develop behind this idea for some years.

AEC is moving into two other directions to ease atom power into the realm of a going business:

- It is striving to create permanent regulations covering its indemnity program—who's covered? What factors, such as size, location and type of plant, should be given the most weight in arriving at the licensee's private insurance needs?

Proposed changes in the temporary indemnity regulations issued last fall are expected to be announced soon. The utility industry will be invited to participate in hearings on the suggested changes.

- Increasing state participation in inspection activities is encouraged. AEC has submitted a proposal to Congress recognizing states have concurrent jurisdiction.

However, Price and other AEC officials insist there is no thought of the federal government abandoning its responsibilities. Only a handful of states have adequate laws or personnel to take on inspections.

Rep. Holifield, for one, has warned AEC that it must err on the side of caution, if necessary, in safeguarding the public. Just one incident, he warns, would stir such public wrath that atomic power development would be stunted.

NUCLEAR NOTES

An anti-strontium compound that can remove the radioactive element from living bone and other body parts has been developed by Argonne National Lab chemists. The harmless compound could lead to a series of substances to rid humans of other fallout products.

An aluminum alloy designed for fuel element cladding has been developed by Argonne National Lab personnel. They add small amounts of nickel to aluminum 1100, a commercial alloy containing iron, to increase the corrosion resistance.

Successful sphere tests at Dresden station included a 37 psi trial. This is 25% above design pressure.

Cost reduction is a major aim in building the Pathfinder controlled recirculation boiling water reactor, according to Allis-Chalmers Mfg Co's C. B. Graham. A nuclear superheater using stainless steel-clad fuel elements will produce temperatures exceeding 825F. Aluminum core fabrication also will lower costs.

PP&L's A-Plan Is Altered

The Atomic Energy Commission, bowing to opposition from Congress, has altered its third round proposal for partnership development and construction of a single-region slurry homogeneous power reactor in Pennsylvania.

Pennsylvania Power & Light Co and Westinghouse Electric Corp filed a proposal last December seeking AEC assistance for the project under the power demonstration reactor program.

Commenting on the change, J. K. Busby, PP&L president, said, "This action has been mistaken by some as a withdrawal of the former proposal, when it actually is a change in mechanics. The same end will be accomplished if the JCAE approves this new request. We feel . . . the matter should be presented so that the Joint Committee will have the definite power of approval or disapproval over the availability of government research and development funds."

Under the tentative arrangement submitted to the Joint Committee on Atomic Energy in March, AEC would provide some $7 million for preconstruction research and development to be performed during the next two years.

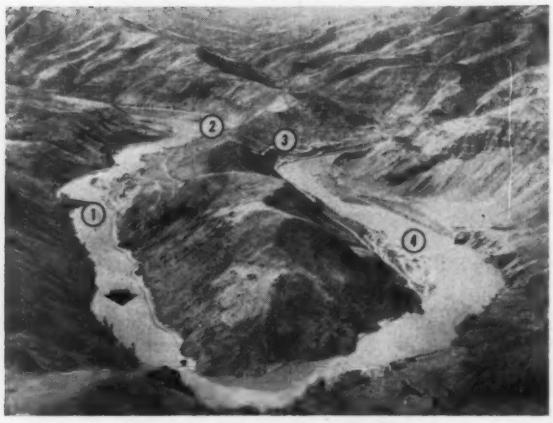
After this period, if the companies and AEC agreed the project was feasible, the firms were to go ahead with construction and operation of the plant with additional federal help amounting to about $22.3 million. If the companies wanted to pull out without the blessing of the AEC, they would have to repay the initial $7 million to the government.

Democrats on the Joint Committee protested that the proposal was one-sided—that the arrangement, in effect, committed Congress and AEC to the entire project, but left the companies free to pull out after the R&D phase.

The Democrats claimed the proposal violated the term of the third round—and got backing from the comptroller general.

As a result, AEC made its alternative request for "specific legislative authorization of a cooperative arrangement" with the companies. This was expected to boil down to an R&D contract, with the Joint Committee getting another chance later to pass on the merits of construction of the reactor.

Reliable sources say that research and development will continue as scheduled to determine feasibility of this type of nuclear plant. Estimated completion date was set at December, 1963 in the companies' original proposal.



Big Harness at Big Bend

Idaho Power Co's construction tempo is now in high gear in the rugged "oxbow" bend of the Snake River along the border of Idaho and Oregon. The company's 205-ft, rock-fill Oxbow dam (No. 1) will block the river. Back-up water will be funneled by an intake structure (2) into two tunnels leading to the powerhouse (3). The crushing plant (4) provides rock to make concrete here and at Brownlee, 12 mi upstream.

A large work force is rapidly excavating for the Oregon spillway, the company reports. Excavated material will be used to build a cofferdam that will help isolate the embankment area from the river. Construction at both ends of the diversion tunnel involves work on a gate structure at the upstream end and fish-handling facilities at the downstream end.

Co-op Files Suit on Loan Ruling Requiring Prior PSC Approval

The courts will decide whether the Indiana Public Service Commission has the right to say when the state's 43 cooperatives may borrow money. Southeastern Indiana Rural Electric Membership Corp has filed a suit asking that a clause in a PSC order issued Feb. 7 be stricken from the order. The clause defined the REMC as a public utility and said it could not become indebted without PSC permission.

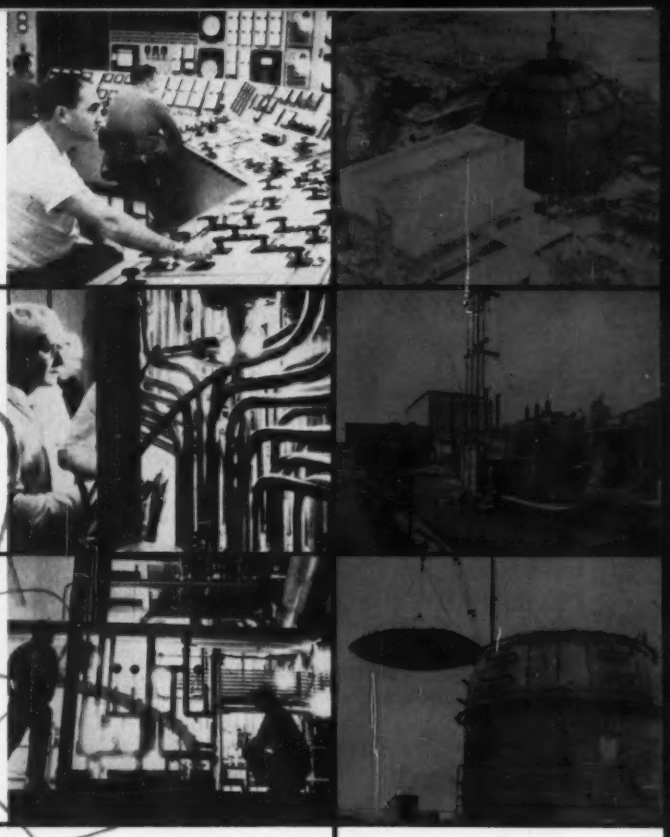
A later order stated that all Indiana REMC's must get prior approval for their financing from the commission.

The REMC's have petitioned the commission for a hearing, and also filed notice they will appeal the ruling to the Indiana Appellate Court.

The commission order was branded by co-ops as a move to "grab control" away from their 160,000 members. However, PSC Chairman John Van Ness said the agency had no choice—that a 1947 decision of the Indiana Supreme Court declared co-ops were public utilities, and therefore the PSC must regulate their finances as it does any other utility.

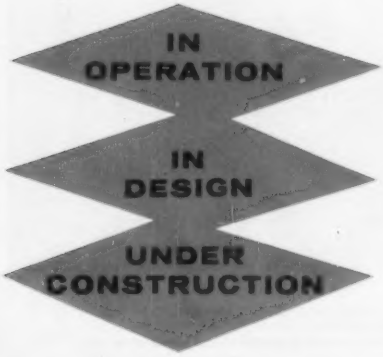
The disputed 1947 Supreme Court decision was, at the time, regarded as a victory by Kosciusko County REMC. The decision reversed a lower court order and said the REMC, as a public utility, had the right to serve a rural area, which Northern Indiana Public Service Co also wished to serve. NIPSCO had maintained that the REMC was not a public utility.

A SPECIAL REPORT:



JOHN J. KEARNEY,
Assistant Managing
Technical Editor

3rd Annual Nuclear Power Report



Nuclear power generation is entering a new era. After many necessary years of study and design estimates, we are at last beginning to accumulate operating experience with this new type of heat source. The available information is meager of course, but what there is of it is encouraging. A roundup of the available operating information on five power reactors operating in the United States is contained in the following special report.

Tables giving the vital statistics of other major power reactor projects are included.

Five Nuclear Power Reactor

Nuclear Power Reactors in Operation Measure up to Designers' Expectations

Power reactor operating experience is meager, yet whatever there is of it is very encouraging. Reactors are behaving pretty much as their designers expected. In some areas of operation reactors have functioned even beyond expectations. The 60-Mw(e) Shippingport pressurized-water reactor is the only utility-size unit in operation. And because it went on the line only late last year, it hasn't logged many operating hours.

Other power reactors operating in the country include a 5-Mw(e) boiling-water reactor at the Atomic Energy Commission's Argonne National Laboratories, a 5-Mw(e) boiling-water reactor at the Vallecitos Laboratories of the General Electric Co, a 2-Mw(e) pressurized-water reactor at Fort Belvoir, Va., and a 7.5-Mw(e) sodium-graphite reactor at Santa Susana, Calif. The Vallecitos reactor feeds power into the Pacific Gas & Electric Co system, and the Santa Susana reactor is connected to Southern California Edison Co's system.

Experience with them so far indicates that reactors:

1. Operate smoothly and require a minimum of control-rod action.
2. Have no unusual operating and maintenance problems. In fact, most troubles encountered in the shakedown periods have been non-nuclear.
3. Have proved to be very stable and capable of accepting load swings.
4. Have, in some instances, thermal capacities greater than design specifications.
5. Are comparable or perhaps better than conventional units in starting up after loss of load or overnight shutdown.

Of course, none of these units has operated for a long period. All must still stand the test of time. Nevertheless results are encouraging.

Company	Duquesne Light Co
Plant location	Shippingport, Pa
Critical	Dec. 2, 1957
Full power	Dec. 23, 1957
Reactor type	Pressurized water
Reactor manufacturer	Westinghouse Electric Corp
Reactor thermal power (design), Mw	236
Reactor thermal power (max reached), Mw	236
Station gross generating capacity, Mw	68 (100-ultimate)
Total output, kwhr (as of _____)	27,068,200 4/9/58
Estimated cost of reactor, millions of dollars[1]	50.5
Estimated cost of turbo-gen plant, millions of dollars	17.5
Total estimated plant cost, millions of dollars	68
Total estimated plant cost, dollars per kw	680 (at 100 Mw)
Estimated cost of energy at busbar, mills per kwhr	64.4
Moderator	Light water
Coolant	Light water
Coolant temp, degrees F[2]	525
Coolant press, psi	2,000
Steam temp, degrees F	Saturated
Steam press, psi	585
Steam flow, lb per hr	835,000 (at 60 Mw)
Fuel, enrichment, % U-235	In excess of 90% in seed. Natural uranium in blanket

[1] Not including research and development, fabrication of fuel for first charge, or nuclear materials unless noted otherwise.
[2] Average temperature of coolant in reactor unless noted otherwise.

Plants in Operation

Argonne National Laboratory (AEC)	Pacific Gas & Electric Co and General Electric Co	Southern California Edison and North American Aviation, Inc	U.S. Army Corps of Engineers
Lemont, Ill	Vallecitos, Calif	Santa Susana, Calif	Fort Belvoir, Va
Dec. 1, 1956	Aug. 5, 1957	Apr. 25, 1957	Apr. 8, 1957
Dec. 29, 1956	Oct. 24, 1957		Apr. 15, 1957
Boiling water	Boiling water	Sodium graphite	Pressurized water
Argonne National Laboratory	General Electric Co	North American Aviation, Inc	Alco Products, Inc
20	20	20	10
61.7	30	7.6	10
5	5	7.5	2
13,981,000 3/4/58	1,693,950 4/15/58		9,334,000 4/15/58
	2.5[4]	7.3	0.1
	0.572	1.3	0.1
4.5[3]	3	8.6	3.5
900[3]	600 (at 5 Mw)	1,150	1,750
52[3]			
Light water	Light water	Graphite	Light water
Light water	Light water	Sodium	Light water
486	545	960 (outlet)	450
600	1,000	3	1,200
486	545	825	407
600	1,000	600	200
60,600	61,000 at 5 Mw(e) 90,000 at 30 Mw(t)	60,000	34,070
1.44%	Enriched U_2O in stainless steel cladding	2.8%	Highly enriched

[3] Based on 50-Mw thermal operation, with $750,000 extra capital for additional turbo-gen capacity and present fuel, total plant cost would be $5.25 million but unit cost would be lowered to $420 per kw and power costs to 33 mills per kwhr.

[4] Not including land, supporting facilities and similar items required for commercial-sized reactor plant.

Nuclear Power Plants in Design

Company	Consolidated Edison Co	Commonwealth Edison Co and Nuclear Power Group	Pennsylvania Power & Light Co
Plant location	Indian Point, N. Y.	Morris, Ill Southwest of Chicago	PP&L service area
Type of financing	Privately financed	Privately financed[5]	AEC Power Demonstration Program[5]
Status of project	Under construction	Under construction	In research and development stage
Reactor type	Pressurized water	Dual cycle boiling water	Homogeneous, single-region slurry type
Reactor manufacturer	Babcock & Wilcox Co	General Electric Co	Westinghouse Electric Corp
Reactor thermal power, Mw	585	626	550
Station gross generating capacity, Mw	275[3]	180 (net)	150
Estimated cost of reactor, millions of dollars[1]	38.0		37[4]
Estimated cost of turbo-gen plant, millions of dollars	45.0[4]		20[1,4]
Total estimated plant cost, millions of dollars	90.0	45.0[4]	57
Total estimated plant cost, dollars per kw	327	250[4]	380
Estimated energy cost mills per kwhr	10-12	7-8[7]	
Estimated operating date	1960	1960	Late 1963
Moderator	Light water	Light water	Heavy water
Coolant	Light water	Light water	Fuel slurry in heavy water
Coolant temp, degrees F[2]	500	545	465 (inlet) 580 (outlet)
Coolant press, psi	1,500	1,000	2,000
Steam temp, degrees F	1,000[3]	545	444
Steam press, psi	370	1,000	400
Steam flow, lb per hr	2,200,000	1,400,000 (primary) 1,200,000 (secondary)	2,000,000
Fuel, enrichment, % U-235	Fully enriched. Thorium used as fertile material	1.5%	Max enrichment UO_3 in slurry form, ThO_2 as fertile material

[1] Not including research and development, fabrication of fuel for first charge, or nuclear materials unless noted otherwise.

[2] Average temperature of coolant in reactor unless noted otherwise.

[3] Will use separately fired superheater to raise steam temperature from 450 to 1,000F. Superheaters will provide 112 Mw of capacity, reactor 163 Mw.

[4] Includes $13 million for oil-fired superheater.

[5] Commonwealth Edison will pay $30 million (charged to plant account). Remaining $15 million will be supplied over period of

or Under Construction

Yankee Atomic Electric Co	Power Reactor Development Co and Detroit Edison Co	Consumers Public Power District, Columbus, Nebr	Central Utilities Atomic Power Associates
Rowe, Mass	Frenchtown Township near Monroe, Mich	Hallam, Nebr	Sioux Falls, S. D.
AEC Power Demonstration Program	AEC Power Demonstration Program	AEC Power Demonstration Program	AEC Power Demonstration Program
Construction permit issued	Construction proceeding under conditional construction permit	AEC contract signed In design stage	AEC contract signed Research & development
Pressurized water	Fast breeder	Sodium graphite	Boiling water, forced recirculation
Westinghouse Electric Corp	Power Reactor Development Co	North American Aviation, Inc	Allis-Chalmers Mfg Co
492 (392 initial)	300	245	203[11]
145 (120 initial)	100	81	66
23.6 (AEC estimate)	34.2	29	
15.7 (AEC estimate)	14.1	11.3	
	68.8	40.3	28
	688	550	
12-14		10-11	
1960	1960	1960-61	1962
Light water	None	Graphite	Light water
Light water	Sodium	Sodium	Light water
508	800 (outlet)	925	489
2,000	92 (reactor inlet)	10	600
470	740	825	825[11]
500	600	800	500
1,800,000	1,000,000	730,000 (gross)	600,000
2.6%	About 27%	2.5%	1.6

five years by Nuclear Power Group.

[6] Based on contract price.

[7] Not capitalizing $15 million of research and development cost.

[8] Under this program AEC will offer certain assistances such as grants for research and development work.

[9] Includes site, chemical processing plant, and waste disposal facilities.

[10] Includes transmission switchyard.

[11] Will use separately fired superheater to raise steam temperature from 489 to 825F. Superheater will provide 39 Mw of capacity, reactor 164 Mw.

IN DESIGN

Nuclear Power Plants (cont.)

Company	Pacific Gas & Electric Co	Florida West Coast Nuclear Group East-Central Nuclear Group[3]	Elk River Rural Cooperative Power Assoc
Plant location	Humboldt Bay, south of Eureka, Calif	Florida	Elk River, Minn
Type of financing	Privately financed	AEC Power Demonstration Program[4]	AEC Power Demonstration Program
Status of project	Proposal submitted to AEC	Proposal submitted to AEC	Contract to be negotiated
Reactor type	Boiling water	Gas-cooled, heavy-water moderated	Boiling water
Reactor manufacturer	General Electric Co		ACF Industries
Reactor thermal power, Mw	165/197		
Station gross generating capacity, Mw	50 guaranteed 60 expected	50	22
Estimated cost of reactor, millions of dollars[1]			
Estimated cost of turbo-gen plant, millions of dollars			
Total estimated plant cost, millions of dollars	Approx 20	25.9	
Total estimated plant cost, dollars per kw	400 on guaranteed 333 on expected		
Estimated energy cost mills per kwhr	Est'd 8.0 with second core		
Estimated operating date	Mid 1962	1963	1960
Moderator	Light water	Heavy water	Light water
Coolant	Light water	Gas	Light water
Coolant temp, degrees F[2]	545	1,020[5]	
Coolant press, psi	1,000	520[5]	
Steam temp, degrees F	545	1,000[5]	
Steam press, psi	1,000	1,000-1,800[5]	
Steam flow, lb per hr	580,000 at 50 Mw		
Fuel, enrichment, % U-235	2% in U_2O zircaloy clad	Slightly enriched	

[1] Not including research and development, fabrication of fuel for first charge, or nuclear materials unless noted otherwise.

[2] Average temperature of coolant in reactor unless noted otherwise.

[3] Members of FWCNG are: Florida Power Corp. and Tampa Electric Co. Members of ECNG are: Appalachian Electric Power Co., Ohio Power Co., Columbus & Southern Ohio Electric Co., Louisville Gas & Electric Co., Pennsylvania Power Co., Monongahela Power Co., West Penn Power Co., Indiana & Michigan Electric Co., Cleveland Electric Illuminating Co., Dayton Power & Light

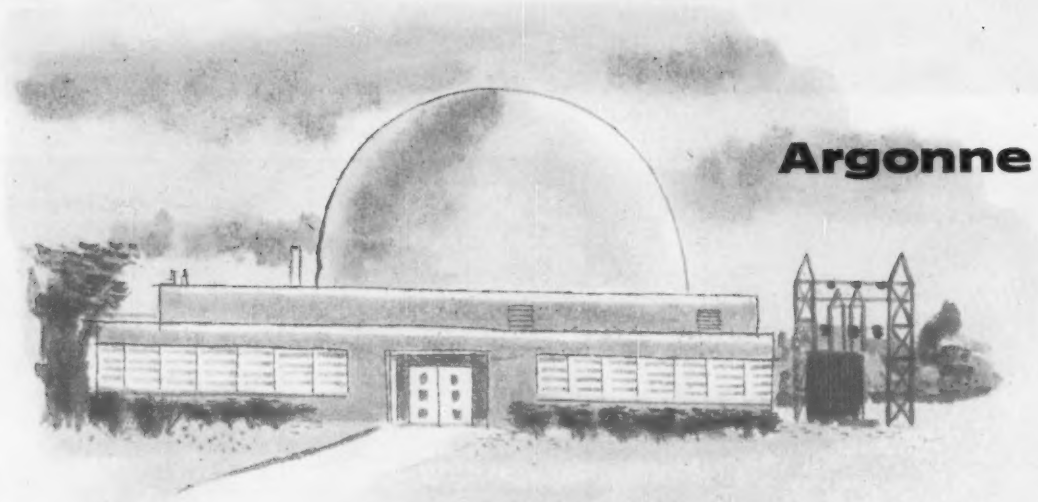
Carolinas-Virginia Nuclear Power Associates, Inc[6]	Municipal Power Dept	Chugach Electric Assoc	Wolverine Electric Cooperative
Parr Shoals, South Carolina	Piqua, Ohio	Anchorage, Alaska	Hersey, Mich
AEC Power Demonstration Program	AEC Power Demonstration Program	AEC Power Demonstration Program	AEC Power Demonstration Program
Negotiation stage	Contract negotiations in progress	AEC Contract signed	
Pressurized water, pressure tube	Organic moderated	Sodium-deuterium	Homogeneous
Westinghouse Electric Corp	North American Aviation, Inc	Nuclear Development Corp of America	
60.5	45.5	40	
19	12.5	10	10
4.3		5.50	
Utilizing existing plant	1.03	1.8	
17	15.3	7.3	
1,000		730	
			7.18-7.43
1962	1961	1962	1959-60
Heavy water	Hydrocarbon	Heavy water	Uranyl sulfate in heavy water
Heavy water	Hydrocarbon	Sodium	Heavy water
530	617	950	
1,500	50	Atmospheric	
725	550	850	
400	450	850	
203,000	150,550		
2%	3% max	2%	

Co., Ohio Edison Co., Southern Indiana Gas & Electric Co., Potomac Edison Co., Indianapolis Power & Light Co.

[4] Under this program AEC will offer certain assistances such as grants for research and development work.

[5] Design objectives.

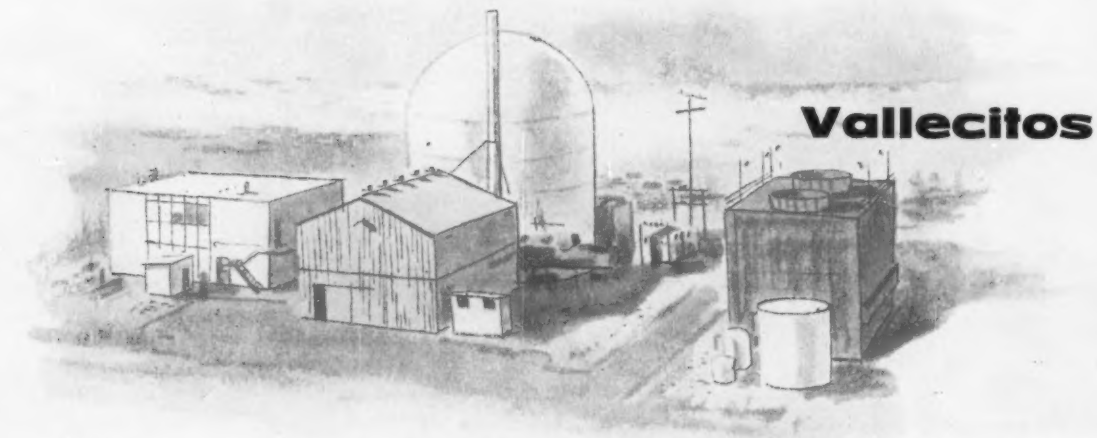
[6] Members of CVNPA are: Carolina Power & Light Co., Duke Power Co., Virginia Electric & Power Co., South Carolina Electric & Gas Co.



The 5-Mw(e) Argonne boiling-water reactor (EBWR) has been in operation longest. As of early last month, it had logged in about 4,600 hr of operation. Since it went on the line in Dec. 1956 it has operated 45% of the time at an average thermal power level of 18 Mw. The designed thermal power level is 20 Mw. The success of the design is really indicated by the fact that the reactor has operated at a level of 62-Mw thermal, over 3 times its design power. And experience has indicated that EBWR is capable of 100-Mw(t) output.

As operating experience has been meager, reactor operating costs cannot be ascertained with any degree of accuracy. This is particularly true of EBWR which is operated as an experiment. Consequently the system is under continuous development. But Argonne engineers and scientists see no reason why operating costs should be high. Trouble-free periods have been long, and any difficulties that occurred have been due to normal shakedown.

On the other hand, there is no reason to expect operating costs to drop below those of the conventional plant, as the need persists for additional specialized personnel. The Argonne installation, for instance, has a consultant radiochemist on the spot in case excess radioactivity is detected, and an instru-



The 5-Mw(e) reactor at the Vallecitos Laboratories (VBWR), the other operative boiling-water reactor, also is giving satisfactory performance.

Here again the big news is concerned with thermal operating level. Originally, AEC Private Operating License No. 1, issued to General Electric Co, imposed two restraints: operating power averaged over a 10-hr period could not exceed 12 Mw(t) and instantaneous

ment servo engineer to assure that the complex signal system gives correct and pertinent information.

One big question mark in the boiling-water concept is the possibility of radioactive carryover to the steam turbine in the absence of an intervening heat exchanger.

Preliminary experiences with the Argonne boiling-water reactor indicates that this need not be cause for concern. The steam turbine associated with this reactor was opened in January to determine the extent and nature of deposition of active materials and the effects of operating the machine with oxygen-containing steam. The turbine radiation survey conducted during this maintenance period indicated that plating out of fission products on surfaces in the steam system is negligible.

This is very significant because some uranium contamination in the reactor vessel was known to exist when the unit went into operation (EW May 20, 1957, p 98). Thus there was some fission product activity passing through the turbine during operation.

Normal Maintenance Procedures Used

Regular turbine maintenance personnel were used and were able to work normally in virtually every way. The only departure from standard practice was use of face masks during the casing diaphragm cutting operation upon disassembly.

A complete radiation survey of the turbine interior revealed a radiation level of less than 5 milliroentgens per hr (mr/hr) on all surfaces, even those on which concentration of deposits might be anticipated. In view of the accepted tolerance dosage of 7.5 mr/hr for 8 hr per day, this means that maintenance personnel can enjoy essentially complete freedom in their operations. Moreover, the 5-mr/hr maximum is a surface reading, which means that personnel receive this dosage only upon contact and considerably less at any distance from the active surface.

Visual examination of the turbine rotor and the Kanigen nickel-plated interior of the casing revealed no unusual areas of corrosion or erosion. But the length of time of operation is still too short to permit real conclusions as to the original need for the plating to protect against corrosion by the oxygen-containing steam. This free oxygen is at relatively high concentration. It is formed by decomposition of water in the reactor core under the influence of radiation and sprayed out by the steam bubbles.

All that can be said now is that the turbine appears to be in satisfactory condition.

Operation of the EBWR at 62-Mw thermal, or 3 times its design power, was achieved without physical revision of the plant. Although the turbine is designed to utilize 20 Mw of steam, the condenser and a cooling tower are capable (by design) of rejecting 40 Mw of heat. With the turbine, condenser, and cooling tower operating at maximum capacity on a very cold day, sufficient heat removal capacity was realized to permit 62-Mw reactor operation.

To work on the reactor itself, a shutdown is necessary. The cooling-off time after shutdown, however, is a function of thermal stresses in the vessel and is not limited by nuclear considerations. Approximately 48 hr are required to cool down the pressure vessel before the head can be removed.

As in all water reactors, startup is a matter of obtaining a neutron flux period* and allowing the neutron flux to rise until power produced by the core raises the core temperature. The boiling and heating of the experimental boiling-water reactor controls the reactivity when power is produced and the period becomes infinite (i.e. the power is steady). The full-power flux signal fluctuates about 2%. This, although larger than the signal from well designed pressurized water reactors, is of little operational importance.

* Amount of time the reactor will take to change its power level by a factor of $e = 2.716$

power 20. With the latter limit, PG&E's 5,200-kw (nameplate) turbine-generator could not be loaded fully.

Upon GE request, AEC modified the license Jan. 25 to permit power level averaged over 24 hr to be 20 Mw(t) and instantaneous 30. This permitted loading the turbine to nameplate. Excess steam was dumped to an oversize condenser. Future tests will determine actual turbine capability at reactor steam conditions.

An impressive feature of the VBWR has been its operation at pressures of 900 to 1,000 psi at all power outputs up to 30 Mw(t) with absolutely no signs of instability. Operation to date indicates that the power level is far from that at which instability might occur. During a day's continuous operation at 20 Mw(t) the reactor operated for as long as two hours at constant pressure with no control rod adjustment.

It has also been found that the reactor responds very smoothly to changes in turbine output. An almost instantaneous change of 25% of full load may be made with a reactor pressure variation of only about 10 lbs.

The turbine load can be increased from zero to full load in less than one minute with no severe drop in reactor pressure. These changes are made without by-passing any steam to the condenser.

Both of these characteristics, stability and ability to handle utility-type loads, of the VBWR have reinforced belief that boiling reactors have great advantages for use in large power stations.

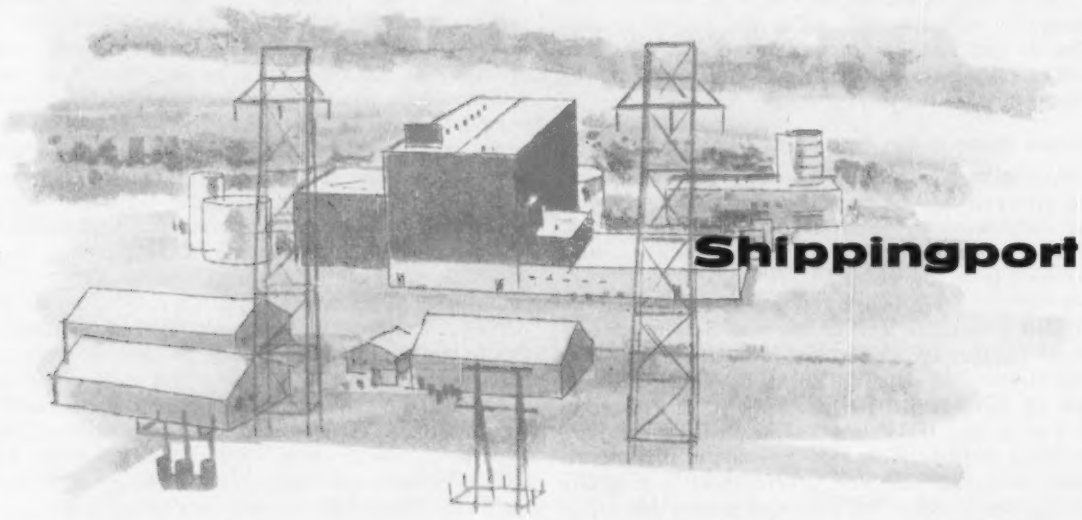
Engineers now feel the reactor will make substantially more than the 40 Mw(t) they reported as maximum thermal level in EW's 1957 Nuclear Report. They view the AEC-approved increase as the first in several steps approaching the reactor plant's actual capability. There is a program underway to determine this maximum. Thermal outputs in the range of 60 to 100 Mw are being considered. As a step, equipment for forced-circulation, dual-cycle operation is being installed during a scheduled maintenance shutdown.

Operating ease and stability have been significant. The unit can be brought from startup to full power in 1 min. Maintenance needs have been low.

A prime purpose of the Vallecitos plant is to check

design and operating characteristics for the 180-Mw Dresden plant. Dresden will use differently-designed fuel rods, so there has been much changing and redistributing of fuel rod designs in the Vallecitos core, giving a severe test of shutdown, startup, and fuel change techniques. Results have been promising; in one case the reactor was shut down and opened, fuel rods changed or redistributed, and the reactor bottled and brought back to full power in less than 24 hr.

During 1957's two months of operations, the reactor



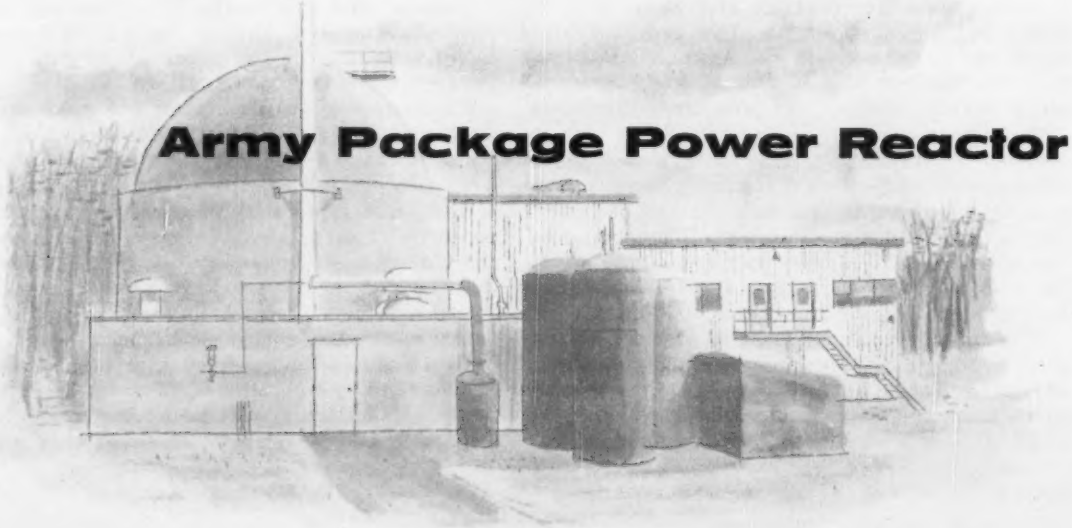
Shippingport

The 60-Mw Shippingport pressurized-water reactor, largest power reactor operating in the country, went critical on Dec. 2, 1957 and delivered power to the Duquesne Light Co system 16 days later.

Although the plant will serve primarily as a test facility, it has been designed to operate insofar as is possible like a conventional unit.

Initial operating experience indicates that it will undoubtedly meet this design expectation. Operating engineers have stated that:

1. It is possible to achieve an overnight shutdown and maintain near normal plant temperatures after inserting the reactor control rods to stop all fission effectively. Temperature of the reactor coolant can then be main-



Army Package Power Reactor

was on the line at power 48% of the time. In 1958, until shutdown Feb. 6 for scheduled maintenance and addition of dual-cycle equipment, availability was about 50%, with almost all downtime charged to scheduled experiments such as fuel rod changes and distributions to check data for Dresden design.

Fuel life has been good, but control rod life disappointing. VBWR's original boron-carbide control rods have been replaced by a combination of boron-steel rods and newly-designed boron-carbide rods. This change was based on data of the first three operating months. Reason for use of original boron-carbide rods was to get experimental data on a very simple, inexpensive control rod design. Original rods were fabricated to allow water contact with the sintered boron-carbide plates. Three months use resulted in some boron-carbide's escaping into the moderator-coolant. Therefore, the rods were replaced.

tained by heat produced from intermittent operation of the main coolant pumps. Heat given off from these totally enclosed pumps, circulating the reactor coolant through the inactive core, is enough to make up for radiation losses.

2. A startup from a hot condition can be achieved in about 1½ hr. A similar startup of a conventional station requires 2½ hr. This refers to the case of an overnight outage for capacity reduction where advance notice of system capacity requirement schedules has been given. Under these conditions the reactor can be brought critical (rods withdrawn to heat-generating condition) in 30 min before steam is admitted to the turbine. The turbine can be steam slow rolled and generator synchronized and partially loaded within 1 hr.

3. Power output from the reactor will probably follow all but the largest load changes without requiring immediate control-rod movement, due to the negative temperature coefficient of reactivity. Negative temperature coefficient, an inherent control feature, causes a decrease in power output when the temperature of the water in the core increases. Thus the core provides only that heat which is removed from it.

The following accounts of actual operating experiences indicate the success attained at Shippingport.

On Dec. 24, 1957, while operating at normal conditions with 44-Mw output, the station load was completely dropped in a single step during a period of several seconds. Average reactor coolant temperature rose from 523 to 529F. It then returned to normal after causing reactor power level to decrease automatically. No control-rod motion was necessary.

The surge in the pressurizer level system that maintains pressure in the primary water loop was 10 in. This was restored automatically to normal with the coolant temperature. No relief valve operations took place on the primary or secondary systems. Full-load capability of the station was available immediately after this incident. Only the system network limitations governed rate of increase to previous output level.

On another occasion the turbine throttles were tripped closed while carrying full load (60 Mw) at normal conditions of temperature and pressure. Although there was a complete stoppage of steam flow to the turbine, the reactor power was again automatically reduced by temperature coefficient with sufficient speed to prevent either primary or secondary system relief valve operation due to excessive pressure.

During this incident one group of reactor control rods was inserted a maximum of several inches to correct coolant temperature. Normal reactor coolant conditions of temperature and pressure were restored immediately. The ability of the station to recover full output was limited only by the time required to restore the turbine plant to synchronous speed, synchronize the generator, and load at system rate limitations.

The Army Package Power Reactor (APPR), also a pressurized-water reactor, has compiled a very impressive operating record since first reaching full power on April 15, 1957. It has passed a full battery of tough guarantee tests, including an initial operating test of 700 hr with a maximum allowable down time of 40 hr. Actual down time during that test totaled 7 hr, 24 min.

On two occasions since the plant went "on the line" it has supplied the Fort Belvoir post with electricity while distribution lines of Virginia Electric Power Co were out of service. Most recently, the nuclear station filled in for VEPCO on March 21 and carried the fort's load for 5 hr after a severe snowstorm knocked out the utility's service.

As of April 1, APPR-1 had generated more than 8½ million kwhr of electricity, and during its first year of operation required only minor adjustments or changes. None of the problems encountered involved the nuclear portion of the plant. While instrumentation difficulties have been more prevalent than other troubles, even these were minor.

These instrumentation problems centered around the extreme sensitivity of the control features of the plant. Generally speaking, reactor control systems installed to date have been overdesigned to cut to a minimum the chances of a nuclear incident.

The Belvoir plant has taken substantial load swings in tests with no ill effects. In fact, these load swings have been made without any control-rod movement, because the reactor's negative temperature coefficient has been able to make the necessary adjustment.

Contamination control and radioactive plant waste have not as yet been problems, because there has been very little waste to dispose of. The only major source of contamination expected to exist is the concentrated activity in the demineralizer cartridges, and this ac-

cumulation is proving slower than anticipated by initial design considerations.

No attempt has been made to increase the power output of APPR-1 because of secondary-system limitations. The conservatism in the design, however, is indicated by the fact that ALCO Products, prime contractor for APPR will employ the same basic core in a power plant rated at twice the thermal output.

The sodium reactor experiment (SRE) at Santa Susana, Calif. is one of the few non-water power reactors operating. Use of sodium, of course, is alien to conventional power plant practice. So naturally it is hoped that valuable operating experience with this new medium will be obtained.

The reactor went critical April 25, 1957 and began low-power runs three months later. Total operating time to date has been only about 300 hr of intermittent functioning in a conservatively scheduled program of checking characteristics and uncovering problems in an orderly fashion.

Early data showed excessive thermal stresses might be placed on critical areas of the reactor tank on shutdown from full power, due to over-rapid cooling by sodium convection. Therefore the reactor has not yet been allowed to approach full power, but eddy-current brakes, designed to bring the sodium to a rapid stop, are now being installed. The brakes also will slow the sodium to a rate matching power decay on normal shutdowns.

Because this is an experimental plant, need for minor modifications was expected. Experience has shown where these were necessary, and they're being made.

Here are some of the other things done:

1. A pump has been added to reduce leakage between the plenum feeding the fuel channels and that feeding the space between the moderator cans.

2. Additional flow-programming devices have been added to the sodium system. These two changes also will reduce thermal stresses during high-power operations.

3. Cold traps for removing oxygen from the sodium circuit will be attached with flanges, rather than welded, to simplify maintenance operations.

In general, operation has been gratifying and justifies the confidence the designers had in the basic sodium cycle. Stability under steady, ramp*, and transient conditions has substantially exceeded expectations, proving simplicity of control. The negative temperature coefficient has been demonstrated and an automatic neutron-flux control system proved out. Ease of maintaining oxygen content of the sodium with the cold traps has been shown.

No leaks have occurred in the sodium system, the heat exchangers, the zirconium canned moderator assemblies, or the fuel rod jackets. The mechanical freeze seal pumps used in each of the four sodium loops have proved to be very reliable.

The emergency removal of a broken fuel element has been made without special tools, an example of the encouragingly successful maintenance operations to date.

Components have behaved well, except the main intermediate heat exchanger and the steam generator. The former is inadequately and improperly baffled and has heat transfer capability below expectations.

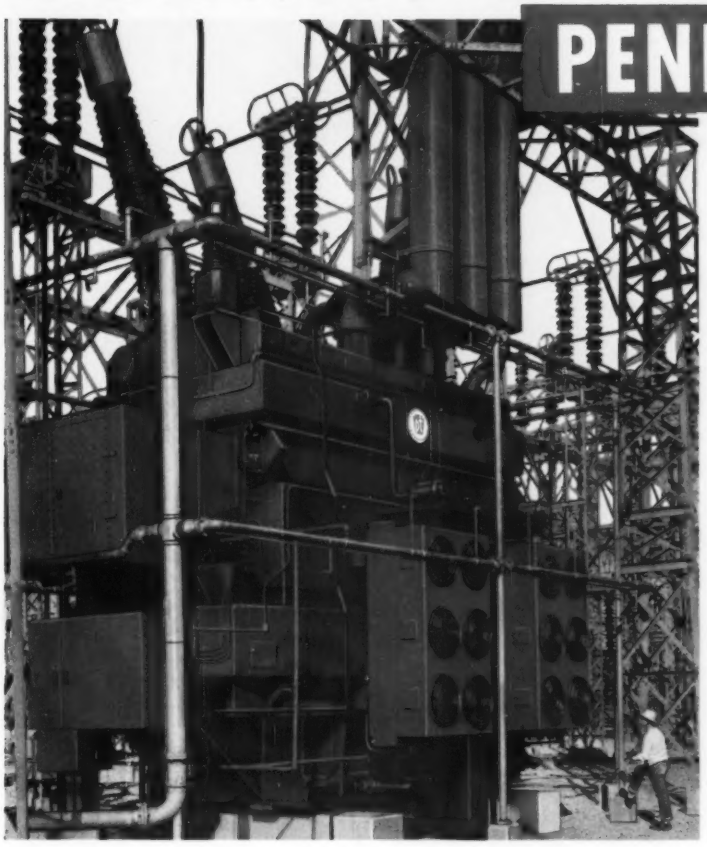
Under the very low load conditions utilized to date, with subnormal sodium pressures and temperatures, steam quality from the steam generator is erratic because of unbalanced or unstable steam and water flow through the tubes. It is anticipated that proper performance will be attained at higher power operation.

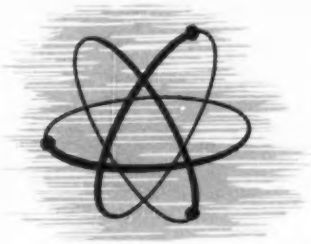
The plant must pass through these subnormal conditions on each startup; but the problem is not regarded as significant because the turbine is normally by-passed during starting operations. For future plants, experience gained will permit modifications to design preventing this instability even during subnormal operating conditions.

The plant is now out of service for modifications, but operations are expected to resume as this goes to press.

* Straight line power increase or decrease with time.

FOR 330 Kv POWER . . .
Atomic Energy Plant Relies on Two 100,000 Kva Transformers by PENNSYLVANIA





LOAD TAP CHANGING PENNSYLVANIA POWER TRANSFORMER

. . . one of two 100,000-kva Pennsylvania transformers located at the Portsmouth, Ohio, plant of the Atomic Energy Commission. The transformers step down a transmission voltage of 330,000 volts to 14,400 volts for plant distribution.

Two 100,000-kva Pennsylvania Power Transformers play a key role in the distribution of power throughout the Atomic Energy Commission's Portsmouth plant. With a high voltage rating of 330,000 volts, these "step-down" units are among the highest voltage transformers ever manufactured for use in this country. Their integrated load tap changing equipment boasts the "quiet ruggedness" that is so desirable in most present-day installations.

Other Pennsylvania features include corona-free high voltage coils that are designed for uniform impulse voltage distribution . . . and of course the well-known Pennsylvania "Contour Design" construction, which results in space-saving, weight-saving compactness.

McGRAW EDISON

For the full story on these and other Pennsylvania design and construction details, you are invited to contact Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

PENNSYLVANIA TRANSFORMERS pt

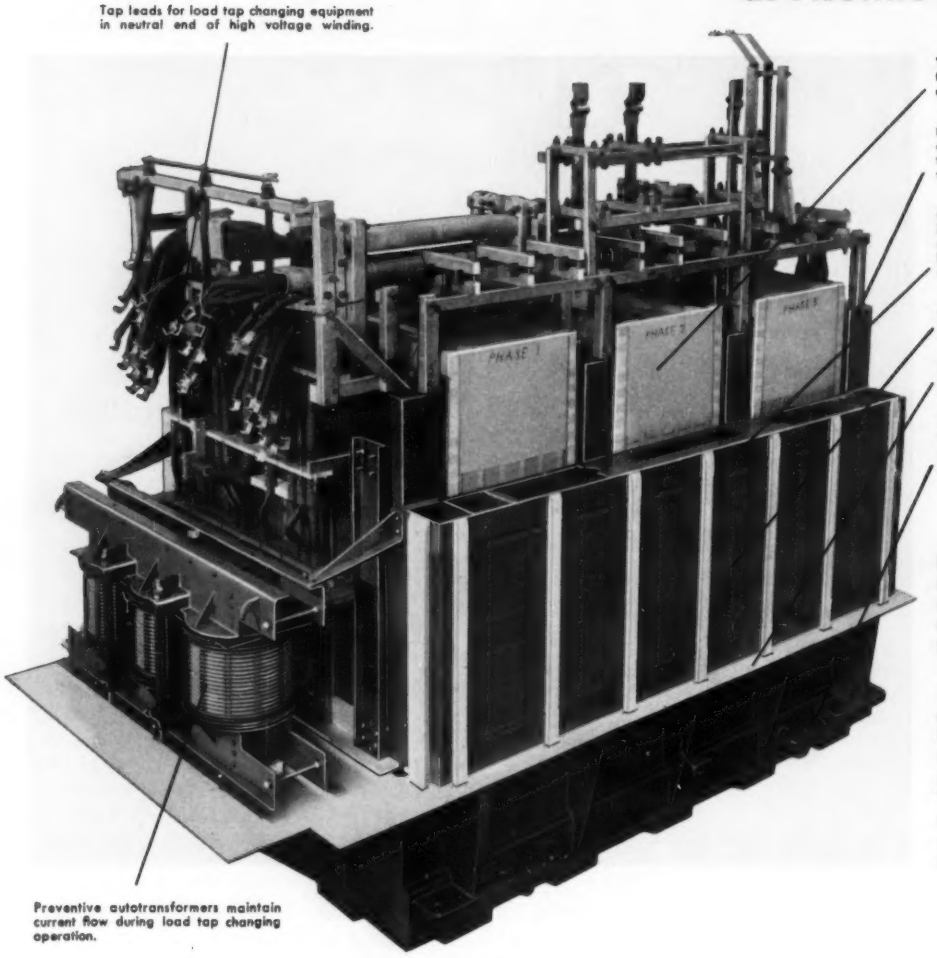
PENNSYLVANIA POWER TRANSFORMERS

See other side for design details

330 Kv Pennsylvania Power Transformer

ONE OF TWO 100,000 Kva PENNSYLVANIA "*CONTOUR DESIGN*" LTC POWER TRANSFORMERS

. . . in Step-Down Service at Atomic Energy Plant


Tap leads for load tap changing equipment in neutral end of high voltage winding.
Vertical cooling ducts in coils permit free flow of oil through coils for most efficient cooling.
Heavy box sections which form part of core frame securely clamp coils to protect against mechanical forces during short circuits.
Core and coils clamped together with heavy steel frames to form a rigid structure. Core-and-coil unit can be handled separately as a complete sub-assembly.
Core cooled by both vertical and horizontal ducts.
Core-and-coil assembly rests on flange of bottom section of Contour Design tank.
Oil-distribution duct completely circles bottom of tank. Cooling oil from heat exchangers thus is evenly distributed upon re-entering tank.
Preventive autotransformers maintain current flow during load tap changing operation.

Interior view of one of two identical Pennsylvania transformers serving the Portsmouth, Ohio, plant of the Atomic Energy Commission.

100,000 kva, three phase, 60 cycles, 55°C. temperature rise. Forced-oil, forced-air-cooled, with four heat exchangers. High voltage: 330,000 Grd. Y volts. Low voltage: 14,400△ volts. Load tap changing equipment for ±10% regulation in 32 steps of ⅝%.

Pennsylvania has the *Facilities* and the *Capability* to meet the Largest Power Transformer Requirements...

- A large, expertly-staffed engineering department with long experience in power transformer design—both core form and shell form.
- The ability to design and construct scale models for proving design characteristics.
- A modernly equipped plant capable of producing and testing the highest rated units contemplated by industry today.
- Handling and loading facilities that permit full utilization of manufacturing, shipping and installation economies.

McGRAW EDISON

PENNSYLVANIA pt TRANSFORMERS

PENNSYLVANIA TRANSFORMER DIVISION

McGraw-Edison Company

CANONSBURG, PENNSYLVANIA Greater Pittsburgh District

See other side for installation view . . .

NUCLEAR EXPERTS, Dr. K. H. Woods, General Electric (left), Dr. W. E. Parkins, Atomics International, and A. L. Gethal, Westinghouse, are interviewed by San Francisco press representative on their talks before the Pacific Coast group

Urges Higher Secondary Voltage

PCEA speaker says only full-scale installation can show its desirability for future residential distribution

Only a full-scale installation can demonstrate the desirability of higher secondary voltage for future residential distribution, R. F. Lawrence, Westinghouse Electric Corp, told the Pacific Coast Electrical Association's Engineering & Operating meeting recently in San Francisco, Calif.

Predicting ¼-million annually new air-conditioned homes, Lawrence said that the time is ripe for re-examining distribution design. The system he advocated would serve homes at 240 v-to-ground from 240/480-v single phase or 240/416-v 3-phase secondaries. Either would permit big distribution transformers, saving up to 25% for utilities where diversified demands exceed 3.6 kva per house.

Nationwide changes in load patterns can be traced to air conditioning's upsurge, said R. E. Reinbold, Arizona Public Service Co. Citing experience in serving a high summer-temperature area, he noted that system annual load factor declined to 55.4% as refrigerated air conditioning saturation climbed. In one area having 55% saturation and peak temperature around 120F, annual load factor is 39.6%. When Phoenix' present 7.8% saturation reaches an expected 50%, Reinbold said, average residential load density will be around 8,300 kw per sq mile.

Outages over 10 min preclude re-energization by breakers of some urban and semi-rural distribution, reported L. J. Flanigan, California Electric Power Co. He cited lack of diversity among today's growing motor loads as the cause of inrush tripping on breaker reclosure. More inverse relays, set higher, correct partially, he said, but automatic sectionalizers with delayed closing are often the best solution.

Shippingport Cited

Stability and ease of control plus reasonable maintenance have featured early operations of three nuclear plants. The Shippingport plant operator acts only as a monitor, said A. L. Bethel, Westinghouse, since the plant became fully automatic. Bethel reported that Shippingport is free of many problems plaguing conventional units and credited thorough pre-operational test work.

Utility plant operators can learn sodium-system maintenance quickly, said W. E. Parkins, Atomics International. SRE's primary sodium system components have been replaced or modified in straightforward fashion. Parkins cited emergency removal of a broken fuel element without highly specialized tools at the Santa Susana plant.

Equal satisfaction with early operation and maintenance of the Vallecitos Boiling Water Reactor was expressed by W. K. Woods, General Electric Co. Forced-circulation, dual-cycle equipment is being added.

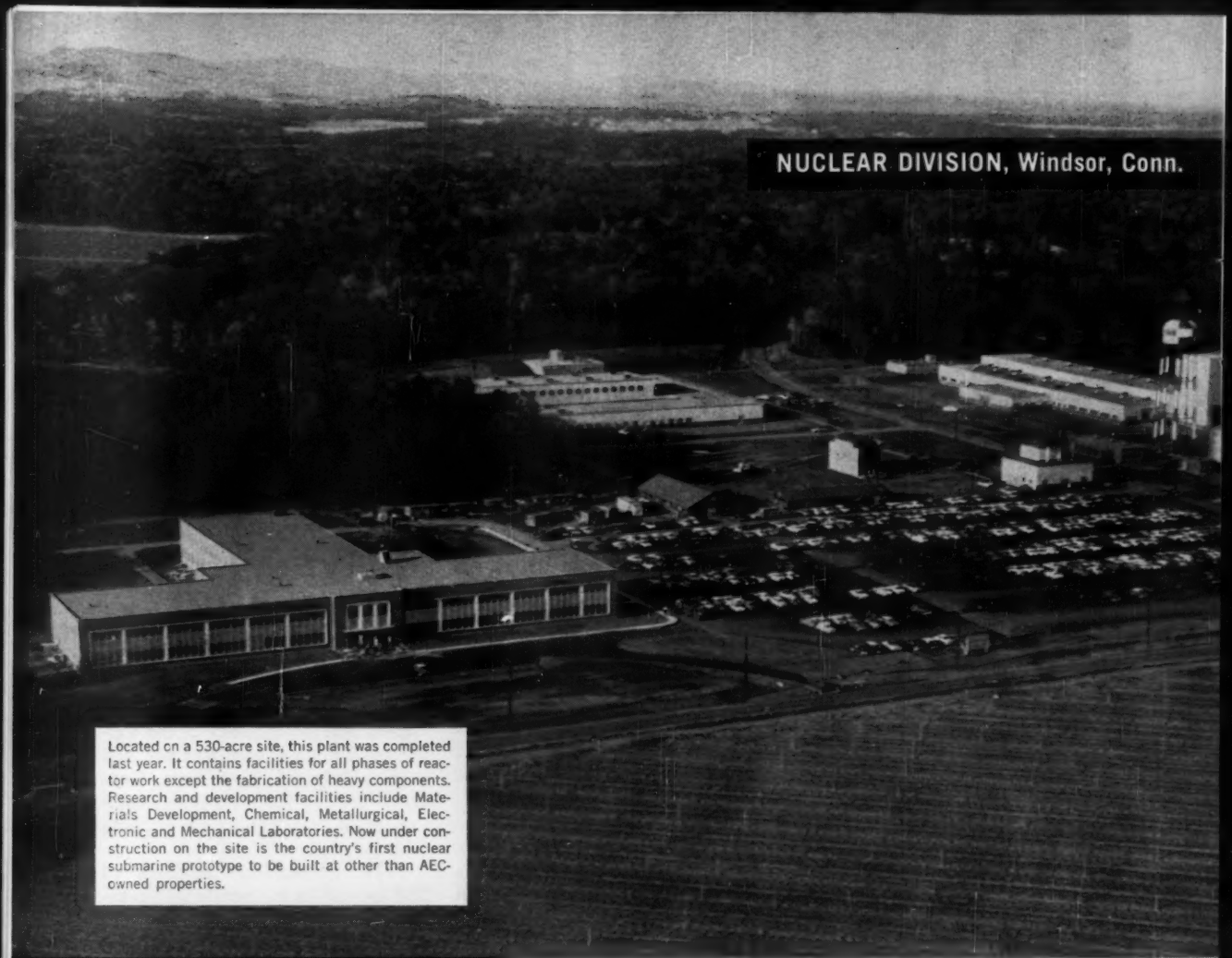
EHV transmission upwards of 345 kv will be economically necessary for supplying the growing power blocks ahead, said T. J. Bliss, Westinghouse. Important applications will be: Transmitting big energy blocks long distances; providing high-capacity interconnections to cut generating reserve needs; and boosting existing right-of-way capability to stiffen transient stability of transmission networks.

Bliss' curves showed two 345-kv circuits providing cheapest 100-mile transmission of 1,000 Mw, larger blocks justifying up to 500 kv.

American G&E 345-kv operating experience has shown high reliability despite an unexpected high flashover rate, Bliss continued. A second ground wire should cut flashovers, and 28-cycle reclosure has been 96% successful.

Air blast circuit breakers will prove increasingly important for higher-voltage transmission, and most systems of 345 kv and up are already using them, said W. R. Wilson, GE. He listed these advantages over oil circuit breakers: Rapidity of maintenance, a com-

(*Continued on page* 94)



Located on a 530-acre site, this plant was completed last year. It contains facilities for all phases of reactor work except the fabrication of heavy components. Research and development facilities include Materials Development, Chemical, Metallurgical, Electronic and Mechanical Laboratories. Now under construction on the site is the country's first nuclear submarine prototype to be built at other than AEC-owned properties.

(ABOVE)—Partial view of Fuel Element Manufacturing Plant at Windsor. This plant includes an 80-foot high building where the intricate job of reactor core assembly is performed.

(BELOW)—Preparing a reactor for test in one of Windsor's two Critical Assembly buildings. Facilities for reactor testing include equipment for chemical analyses, spectrography, spectrometry, destructive and non-destructive tests.

Ready FOR

On these pages are shown Combustion's facilities for the design, development, manufacture and test of complete nuclear reactor systems, including both light and heavy components. . . . These facilities, fully staffed by scientists and technicians, enable the Company to design and manufacture full-scale nuclear power installations for any requirements—civilian

COMBUSTION

Combustion Engineering Building

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS;

This 520-foot building contains the specially designed equipment required for the manufacture of heavy nuclear components. Extremely close tolerances, fine finishes and surgical cleanliness are requisites in the production of these massive vessels. The reactor vessel for the Shippingport Station of Duquesne Light Company—the country's first full-scale nuclear power plant—was constructed in this building.

THE ATOMIC AGE

or military. . . . Combustion is also equipped and qualified to serve the nuclear field in the development of Materials, Mechanisms and Processes, and to provide such special services as Safety Consulting, Radiation Surveys, and Chemical and Biological Analyses. Information on these special services is available and will be sent on request.

C-153

ENGINEERING

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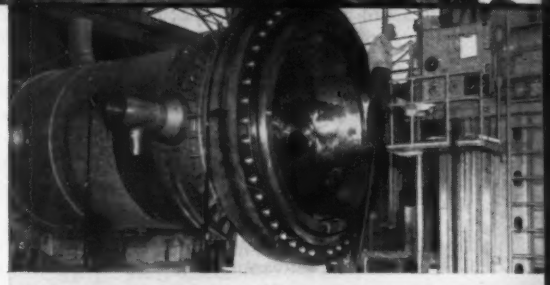
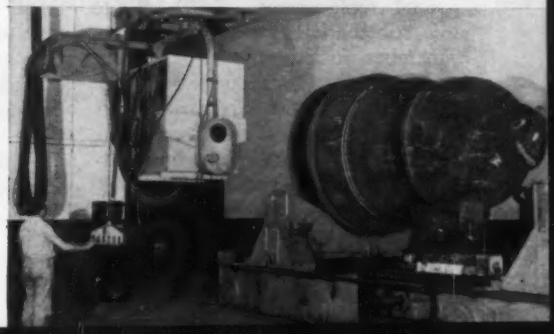


(ABOVE)—Reactor vessel being machined on large horizontal boring mill at Chattanooga. Other specially designed equipment for heavy component fabrication includes cladders, submerged arc and pressure welders, and optical alignment devices.

(BELOW)—15-million volt Betatron X-raying reactor vessel welds. Other Chattanooga testing facilities include equipment for ultrasonic and metallographic examination.



bined "plug-in" interrupter and mechanism, and a building-block approach using common parts for different voltages.

Development of sulphur hexafluoride circuit breakers is actively pursued, said R. E. Friedrich and G. Bates, Westinghouse. SF_6 gas's interrupting efficiency over the full range of voltage and interrupting ratings was held up as its chief advantage. Also mentioned were reduced foundation requirements, elimination of auxiliary oil or air handling equipment, and excellent capacitor-switching and fault-interrupting performance.

345-Kv Cable Need Seen

Looking to a need for 345-kv cable within the next few years, AEIC and EEI steering committees are arranging for field tests of designs of four cable and two terminal manufacturers, said R. J. Wiseman, Okonite Co. Wiseman said Europe, anticipating need for high-voltage cables before the U. S., has led in this field, although the U. S. is supreme in producing the cables.

Sealing pipe ends in plastic caps, coating pipe interior with inhibitor, back-filling with selected sand, and sealing and tapping bell joints for pressure testing helped speed installation of a new San Francisco 110-kv pipe cable. Terminating with 200-psi gas-filled potheads should overcome earlier pothead troubles, reported K. L. C. Dorking, PG&E. And pipe cable appears preferred over duct or trenchlay cable for 69 kv and up, concluded R. C. Blankenberg, Southern California Edison Co. Among advantages are fewer splices, adaptability to large conductor sizes, and protection against deterioration.

Allows More Capacity

A new APS substation design provides for progressive increases in capacity from 7.5 to 64 Mva with minimum rebuild outages and material replacement. T. D. White described the lightweight box-type-member structural design as neat and publicly acceptable. Higher steel cost for the box members is offset by savings on disconnects, buses, labor, foundations and miscellaneous equipment.

More than 50 utilities today use welded aluminum bus, reported D. H. Sandell, Alcoa. And PG&E's experience has shown substantial savings over comparable bolted bus, providing number of connections are large enough to minimize equipment and labor costs, agreed J. A. Maneatis. Both credited the inert-gas welding process with making this construction possible without sacrificing joint or connector reliability.

Design of Southern California Edison's high-voltage transmission system allows relatively liberal limits on line protective devices. As example, system stability is ensured if 220-kv faults are cleared in about 10 cycles, said C. E. Postel. And as modern breakers and relays meet these easy conditions, Edison does not apply automatic reclosing to 220-kv circuits.

Returns Diminishing

Suspecting steam plant designers are nearing diminishing economic returns for efficiency boosts by initial pressure and temperature increases, GE's G. B. Warren suggested investigating gains available at much lower incremental costs and at the other end of the turbine. Particularly, if cold circulating water is available, he said, a possibility might be the use of larger condensers and turbine exhaust ends.

The philosophy of steam plant protective-device application comes complete with a "gray zone of controversy." This lies between the areas of common agreement of tripping only or alarming only certain specific trouble functions, stated J. E. Barkle, Bechtel Corp. Examples of "gray-zone" applications are generator negative sequence current protection, and turbine thrust bearing high temperature protection.

Protective equipment combined with analyzing and computing devices and having inherent "judgment" far more reliable than the human mind, was foreseen by Barkle. One major failure due to poor operating judgment, he stressed, would pay for a major part of such devices' development.

PG&E's coordinated protective scheme for steam plants makes possible fast re-synchronizing after a separation, minimizing down time, according to E. Nilsson. An additional requirement insures a coordinated unit shutdown under full operator control, if at all possible.

Drum Level Still Critical

Underspeed and undervoltage tests on steam station auxiliary buses, conducted by Southern Cal Edison as an aid to new plant design, were described by J. L. Cohon and R. A. Johnson. Factors found important to stability of a modern reheat unit on auxiliary system frequency sag are rate of change, magnitude, and duration of the dip, but boiler drum level remains the critical item. Successful recoveries were logged at full load from auxiliary voltage excursions to 71% for 15 sec.

Use of pulse-type electronic analyzers for locating faults on PG&E open-wire power and communication lines has become commonplace, reported W. W. Beck. At first, crews were reluctant to use the analyzer, but they've been sold on it by consistent accuracies in spotting trouble.

Interest in microwave transfer tripping is increasing along with system complexity, said W. E. Sutter, GE. Therefore the question of how to evaluate microwave reliability is becoming paramount and must be clarified to give industry a common index. Microwave relaying should be engineered overall, relays to relays, Sutter insisted.

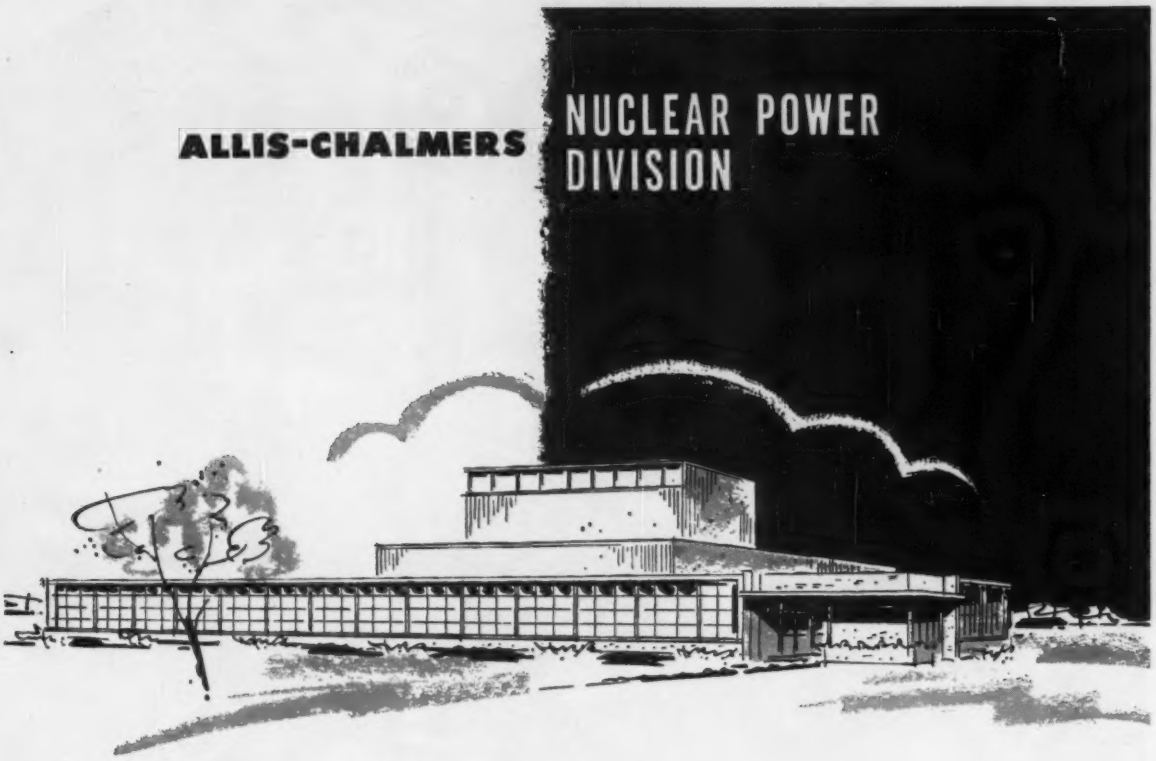
Sees Governor Simplified

Attended control of hydro plants probably will be limited to special types in the future, so strong is the trend toward unattended operation, predicted J. V. Kresser, Westinghouse. PG&E now operates seven full and 20 semi-automatic hydro plants, with ten more scheduled for conversion and four, rated 43 to 135 Mw each, under construction, reported F. I. Lawson.

With few PG&E hydro units ever participating in regulation, the turbine governor is relegated to overspeed protective use only, he said. He predicted early elimination of the relatively complex governor in favor of simple overspeed shutdown and load-limiting devices.

ALLIS-CHALMERS

NUCLEAR POWER DIVISION



New Engineering and Development Facility

...another step into the future!

FROM the days of the Manhattan Project through the building of electric generating equipment for the Experimental Boiling Water Reactor at Argonne, and with participation in Atomic Power Development Associates and Power Reactor Development Company, Allis-Chalmers has been active in the nuclear field. Today Allis-Chalmers is engaged in research and engineering development work leading to the construction of the 66,000-ekw Controlled Recirculating Boiling Reactor for Northern States Power Company, Nuclear Power Plant, Pathfinder.

Supporting this work are more than 100 years' experience in building power equipment and more than 50 years in the manufacture of equipment for generation, distribution, and utilization of electric power.

The new engineering and development facility, now under construction, will contribute directly to Allis-Chalmers growing participation in this field.

In addition, Allis-Chalmers can furnish components specially engineered for nuclear facilities, including: pumps, condensers and steam turbine generators, as well as indoor and outdoor switchgear, transformers, circuit breakers, and motor control centers.

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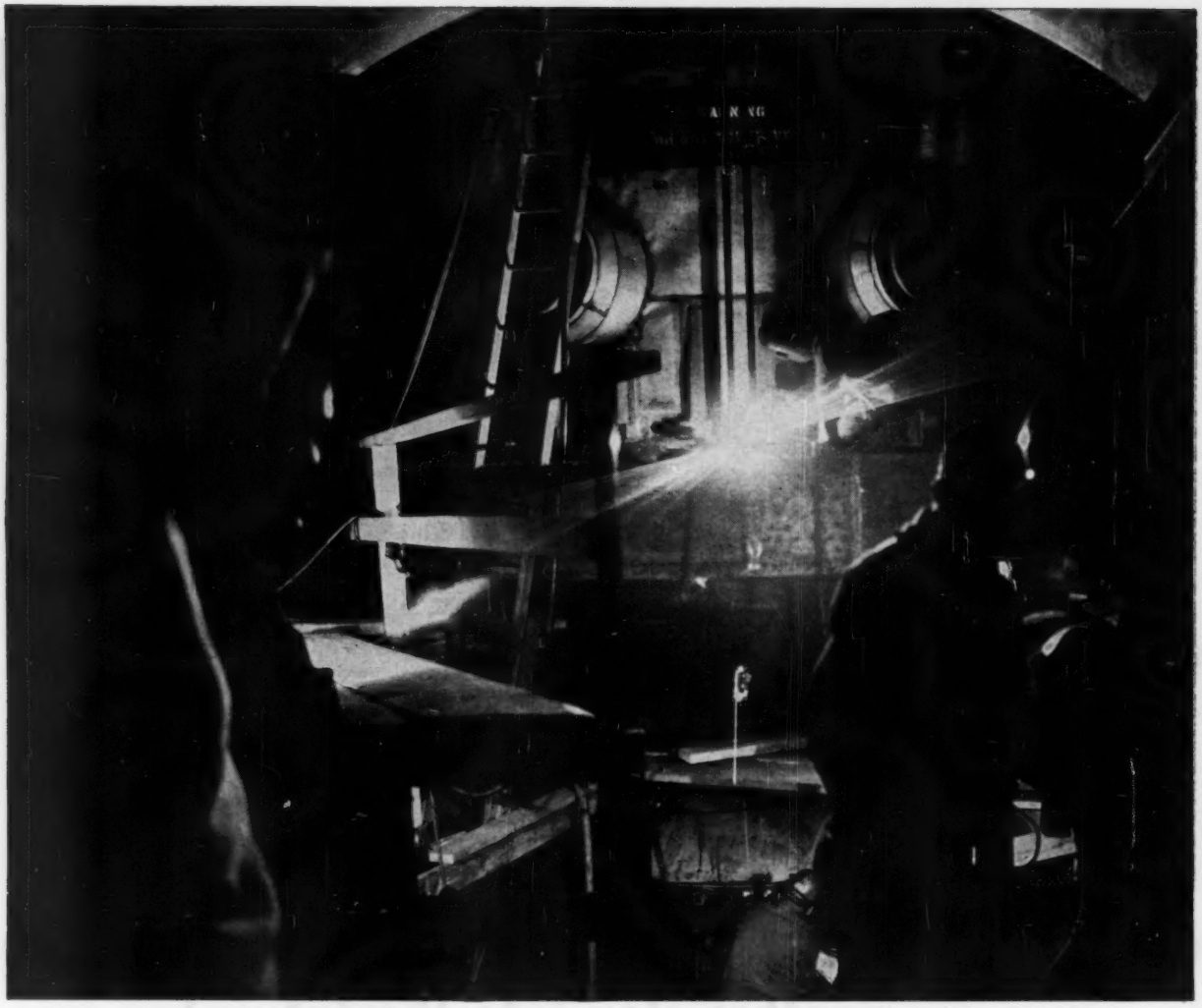


Photos by Robert Yarnall Richie

Rome's station control cable installed

Artist's Sketch of first U. S. full-scale atomic-electric plant. This revolutionary power plant—under the operation of Duquesne Light Company of Pittsburgh—delivers electricity to home and industry in the Pittsburgh area.

Atomic-Electric Power is controlled from this large cabinet installation at the Shippingport atomic power station. Nearly ten miles of Rome's highest quality station control cable are used in this vital system.

Partner to the Atom. Rome's control cable is here being installed in the nation's first major atomic power plant at Shippingport, Pennsylvania. Rome Cable furnished over 50,000 feet of station control cable for this important installation.

in Shippingport atomic power station

This country's first full-scale atomic power plant for the generation of electricity contains almost ten miles of Rome's highest quality station control cable.

The selection of Rome's Rozone-Roprene cable—with a special over-all asbestos outer braid—for this epoch-making installation was no accident, for individual Rozone insulated-Roprene jacketed conductors represent the ultimate in control cable design and performance.

Advantages of Rozone insulation. Rozone—a high-quality oil-base compound—is an excellent insulation. Long and widespread experience has proved that its high-dielectric and impulse strength, combined with its resistance to corona and ozone cutting, makes it an ideal insulation for control and high-voltage power cables. Its electrical properties are practically unaffected by long-time immersion in water or burial in the ground.

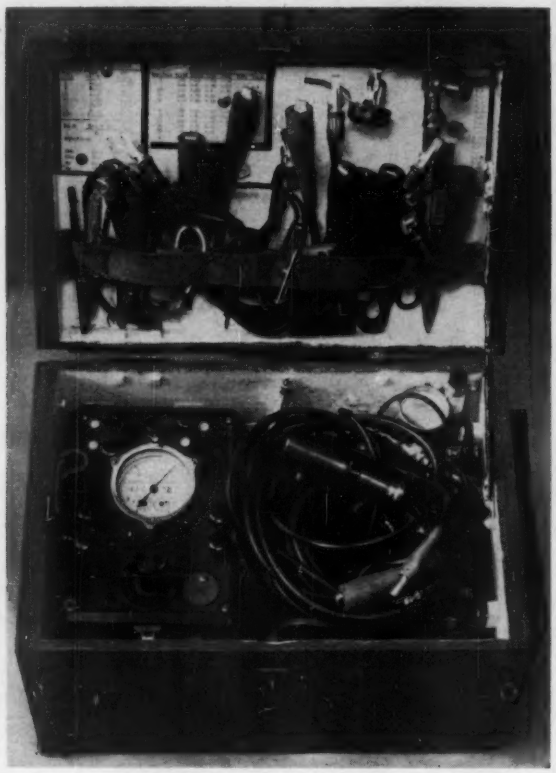
Advantages of Roprene jacket. Roprene—a neoprene synthetic rubber compound developed by Rome Cable—provides an extremely durable and permanent mechanical protective covering for the individually Rozone-insulated conductors. It assures terminations that are resistant to abrasion, weather, and attack by chemicals and oils. And it is exceptionally resistant to fire.

Additional fire protection for this particular cable included a special over-all asbestos outer braid.

Specify premium-quality Rozone-Roprene control cable for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 802R, Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION



Portable Set Saves Meter Testers' Time

W. E. CHRISTNAGEL, Large Power Meterman, Minnesota Power & Light Co, Little Falls, Minn.

This compact portable set reduces both time and trouble in periodic meter testing. The set is used by the Little Falls Division meter department of Minnesota Power & Light Co.

The body of the set houses the rotating standard, phantom load, and test leads. The hollow cover holds tools, jumpers, and various fittings for the test wires. The kit, used with a 4-ft step ladder, is kept in place on the shelf by screen-door hooks on the ladder's legs, hooking into eyes on the box. The tester can reach most of the division's meters from the first step.

This set eliminates carrying various parts of a test outfit separately and hooking them up at each meter. Only two current cables and two potential leads are used. The standard-to-phantom connections are made permanently inside the box. As all accessories are at hand, there is no fumbling in a bag to find the proper jumper or connection terminal. In addition, the ladder provides extra safety for testing outdoor meters.

Special Rig Places Crushed Stone Backfill

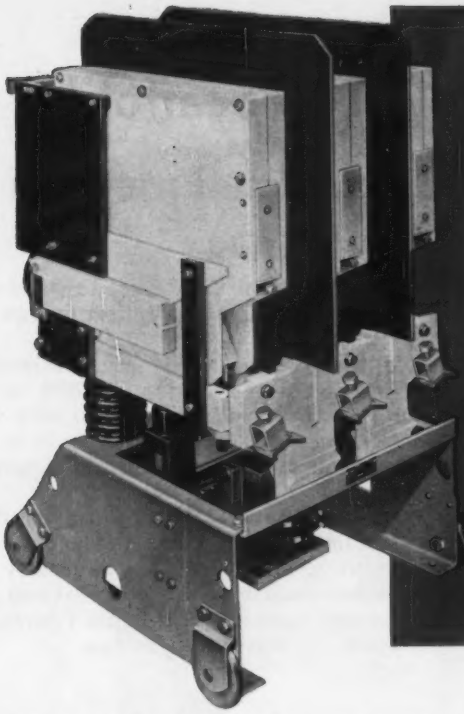
A special rig used by Iowa Power & Light Co permits quick and efficient backfilling of 161-kv H-frame structures with wet crushed stone. The rig, developed by L. E. Myers Co of Chicago, consists of a crawler tractor which pulls a semi-trailer.

The crushed stone is fed through an opening in the back of the trailer into a chute and then into the ground. Flow is controlled by a mechanism operated by a gasoline-driven motor mounted on one side of the trailer. A tank on the other side supplies water through a valve and hose to a shower head over the chute. In winter a bottle gas heater keeps the water from freezing.

The backfill is tamped with compressed air supplied by a separate compressor.

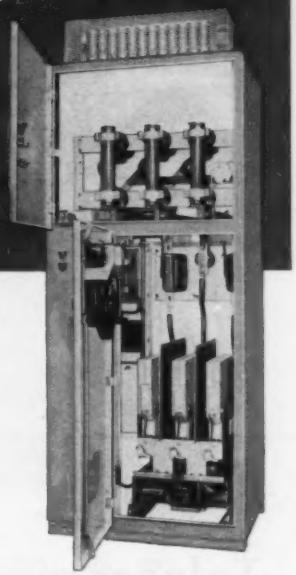
The wet crushed stone backfill was specified for new structures after two tornadoes pulled one leg of a number of H-frames out of the ground. The backfill anchors the poles against uplift and keeps them from giving way under high winds.

(*More How To on page* 100)



Air break starters
for high voltage motors

A-B QUALITY



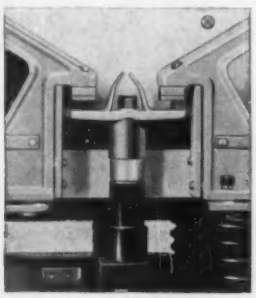
This *new* air break contactor—around which Allen-Bradley has developed a complete line of high voltage starters—is designed to match your *toughest* applications. It features the same solenoid design—with only *one* moving part—that has made Allen-Bradley low voltage starters universally recognized for their tremendous operating life.

These new contactors are available in full voltage and reduced voltage starters —nonreversing or reversing—for squirrel cage, part winding, slip ring, and synchronous motors up to 1500 hp, 2300 volts; 2500 hp, 4600 volts. All starters are equipped with current limiting fuses and have an interrupting capacity of 150,000 kva at 2300 volts and 250,000 kva at 4600 volts.

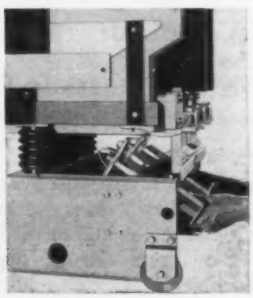
It will pay you to investigate these *quality* starters. Complete information is contained in Publication 6080 . . . please send for your copy, today.

Bulletin 966 high voltage air break, across-the-line synchronous motor starter in NEMA Type 1 enclosure.

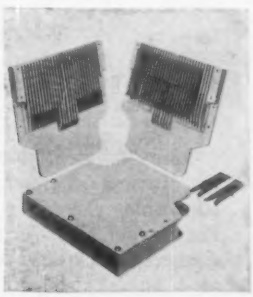
Only One Moving Part. Simple solenoid design eliminates trouble-causing pins, pivots, and flexible jumpers.



Double Break Contacts of silver alloy never need maintenance. Vertical motion assures uniform contact pressures.



Easy Access from Front. Crossbar and contacts removable from front, without special tools, for easy inspection.



Faster Arc Suppression. New blowout design and novel arc chute. Chutes are molded from an arc resistant material.

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In Canada: Allen-Bradley Canada Ltd.
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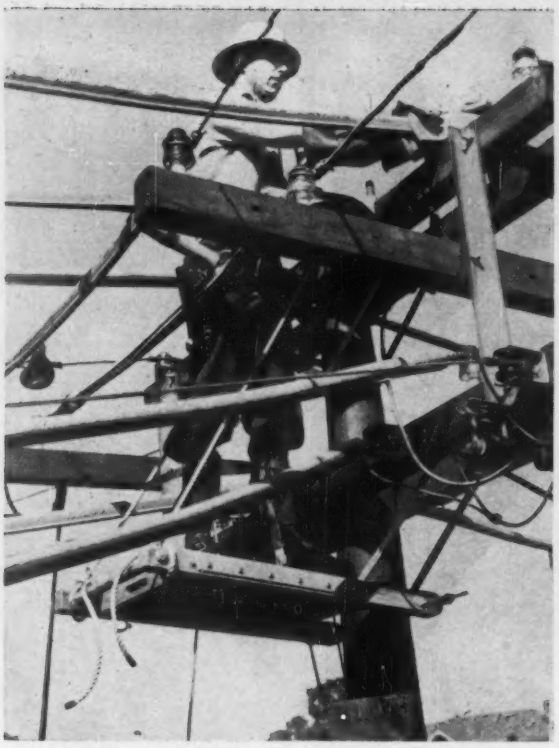
ALLEN-BRADLEY
MOTOR CONTROL
QUALITY



Pole-Top Scaffold Safeguards Lineman

This pole-top scaffold, made of Fiberglas-covered and oil-treated wooden frame, safeguards linemen from electrical contacts.

Capable of supporting two linemen, the insulating platform weighs 25 lb and is 41 by 20½ in. The inner end is attached to the pole by two bolts which straddle and are bored into the pole. Two ½-in. rope straps, secured to either crossarm or pole, support the outer end.

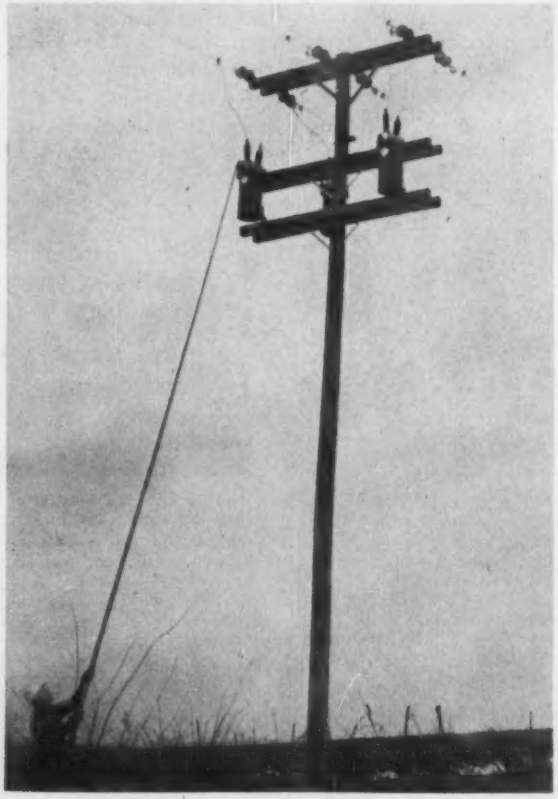
The scaffold is made of fitted ash dowels, pinned with tempered aluminum. Stainless steel lags hold side rails to cross members, and aluminum rivets prevent splitting. The shaped wooden frame is preserved with a linseed oil treatment. Sand embedded in the Fiberglas top provides a non-slip, long-wearing surface.

Telescoping Rod Eases Hot-Line Work

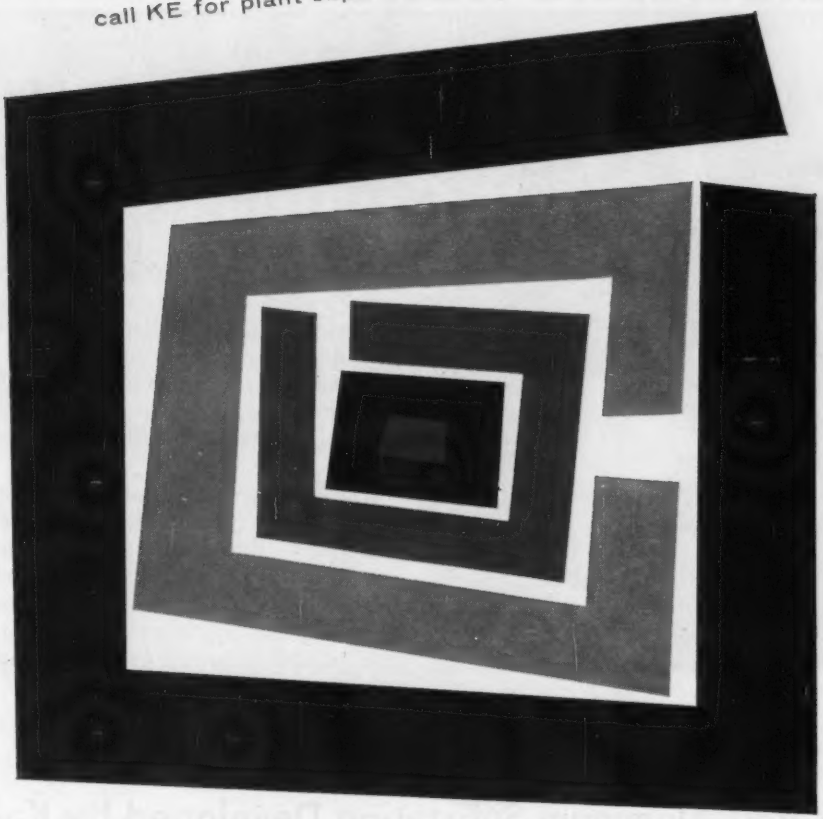
O. B. HAYDEN, Distribution Department, Ohio Power Co, Canton, Ohio

Many different jobs, some in difficult positions, on the distribution system are handled easier with a 28-ft telescoping glass fiber rod which takes a variety of hot-line attachments. As the rod eliminates climbing, disconnects, reclosers, and sectionalizers can be operated without delay. Foreign objects can be removed from live lines safely, even when they are suspended in mid-span. Cost of the rod used by Ohio Power was $78.

The rod has an overall diameter of 2⅜ in., a length of 4½ ft when collapsed, and a weight of about 7 lb. It is available in various lengths with locking joints. Gradual taper of the rod from 2⅜ in. down makes it a sturdy tool. Its relatively small cross section offers little resistance to wind and it has been used in fairly strong winds without difficulty. However, the limberness of slender rods may cause difficulties when used in heavy winds.



call KE for plant expansion or new facilities

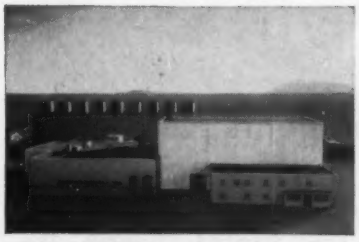


call KE for plant expansion or new facilities

call KE for plant expansion or new facilities

INGENUITY

has made KE the experienced leader in nuclear projects



Engineering Test Reactor, National Reactor Testing Station, Idaho. Designed and built by KE—on schedule and within estimate!

The Engineering Test Reactor, Food Irradiation Reactor, Hanford Production Reactors, Aircraft Nuclear Propulsion Testing Facilities—these represent some of the nuclear energy projects performed by Kaiser Engineers. In each case, KE ingenuity produced efficient, lower cost facilities.

KE's Nuclear Engineering Division has the highly specialized skills and experience required to undertake complete design and construction of nuclear research, production or power generating facilities. Call KE for planning or building your nuclear project.

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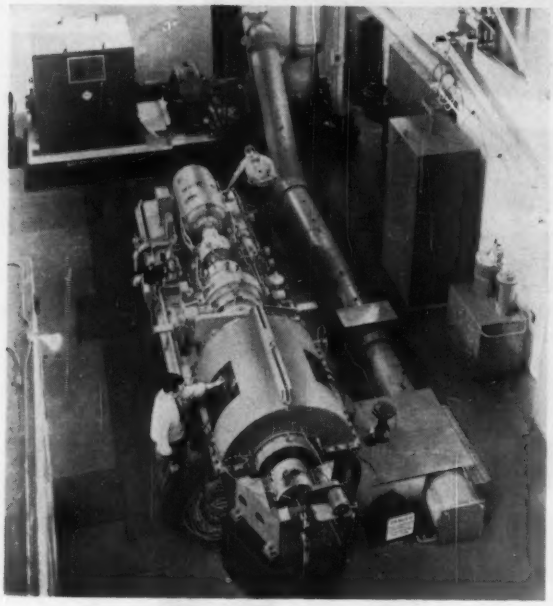
Manufacturers News



Turbine Blade Test Program Conducted at A-C Laboratory

A continuous test program on turbine blades is being conducted by Allis-Chalmers at the West Allis, Wisc, plant in an effort to obtain performance data on current designs. Facilities at the laboratory include the experimental turbine shown left with its dynamometer equipment. Built to accommodate both reaction and impulse blading, as well as governing stage, the turbine is used for single and multi-stage tests and in the design of new blades.

The entire laboratory can be operated from the control room. Many safety devices are incorporated into the system. Relays are arranged to trip the turbine stop valve and to stop the compressor and dynamometer motors for such faults as overspeed, low oil or water pressures, and high bearing temperatures. The relays also operate as an alarm which identifies the fault.

Prefabricated Aluminum Substation Developed by Kaiser

Alrectic, a substation erection method based on the use of standard prefabricated aluminum components, is expected to achieve substantial savings in engineering, field assembly time, and maintenance.

This new development was perfected by Handley-Brown Co of Jackson, Mich., with design and engineering assistance from Kaiser Aluminum & Chemical Sales, Inc, Chicago, Ill. The first installation will be a 46-kv substation for Consumers Power Co. Less than a day is expected to be the time required to assemble the Alrectic components for this substation.

The Alrectic system utilizes standard truss beams along with the fixtures and other parts. The trusses are 1 ft square or 1 by 2½ ft and are available in lengths up to 60 ft. They are welded construction and consist of four extruded aluminum chords supported by lacing. Sides and ends are precision punched with holes spaced at 3-in. intervals.

In the field, the trusses are simply bolted together to form columns and horizontal members. Most members can be raised into position by one or two men. A 10-ft Alrectic truss of the 1-ft square size weighs only 94 lb. A 16-ft aluminum section weighs only 145 lb. Use of aluminum extrusions permits single trusses up to 60 ft in length.

Alrectic substations afford maximum flexibility, it is reported. They can be dismantled and their components reassembled in different form with no loss of parts. The substations will be sold directly to utilities or through organizations who handle complete substations.

Westinghouse Developments Reported

• The Baltimore Gas & Electric Co has ordered a 7500-kva, vapor-cooled, gas-insulated transformer, said to be the second of its kind. The unit, scheduled for delivery by mid-1958, will be rated at 34.5 kv.

The 7500-kva unit will carry 10,000 kva continuously using external fan coolers, and will be approximately the same size as a conventional 7500-kva oil-immersed transformer.

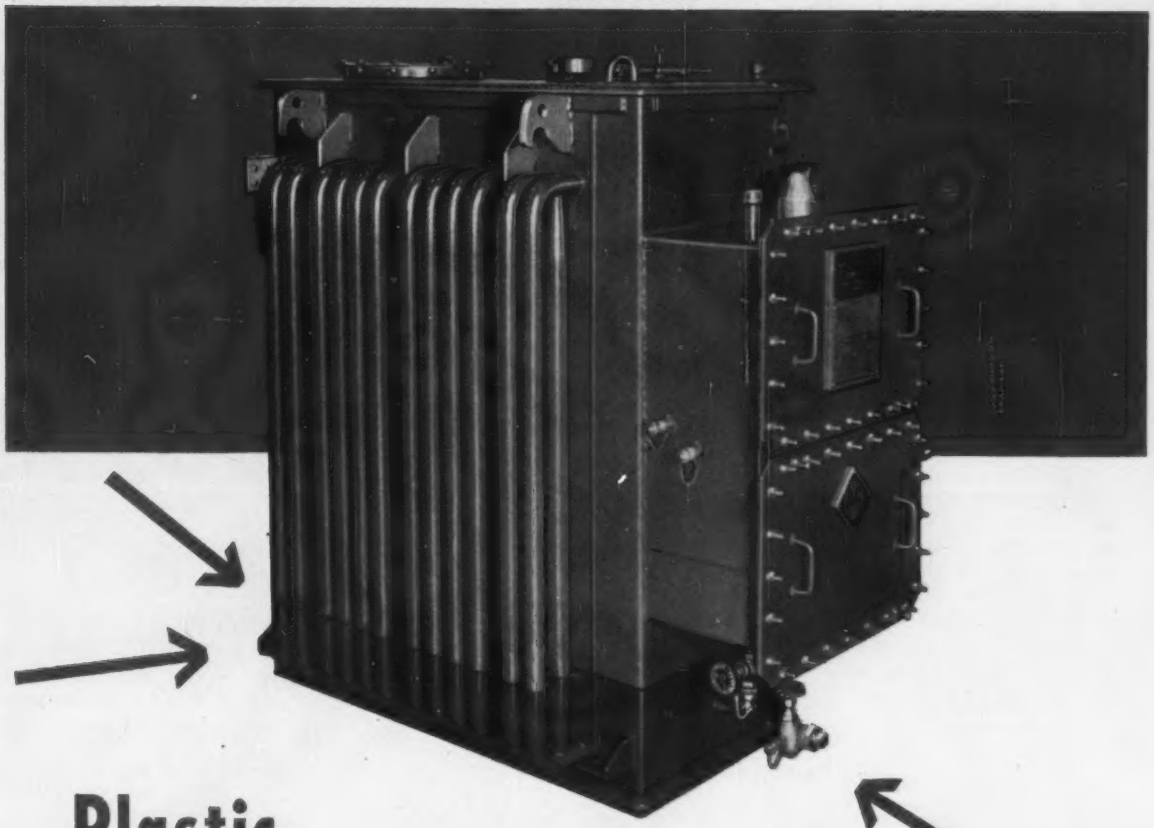
The first vapor-cooled transformer was a 500-kva Westinghouse network unit, now in operation on the Consolidated Edison system.

• The Standard Control Div, Beaver, Pa., has introduced an electrical circuit breaker in which the contacts are clearly visible. Named the Saf-T-Vue, it is designed to meet modern plant safety codes and to overcome perennial customer objection to lack of contact visibility.

• To keep pace with the rapidly changing semiconductor industry, a 160,000 sq ft manufacturing plant

(*Continued on page* 105)

Allis-Chalmers Network Transformers



Plastic Jacket protects bottom and lower walls against corrosion

An extra measure of protection

In many locations, the network transformer often has to stand in inches of water from time to time. That's the very reason why Allis-Chalmers applies plastic compound on the bottom and a foot up the tank walls. Water can't seep through it. Destructive corrosion just can't get its teeth through this tough tar-base material.

Special overall protection, too

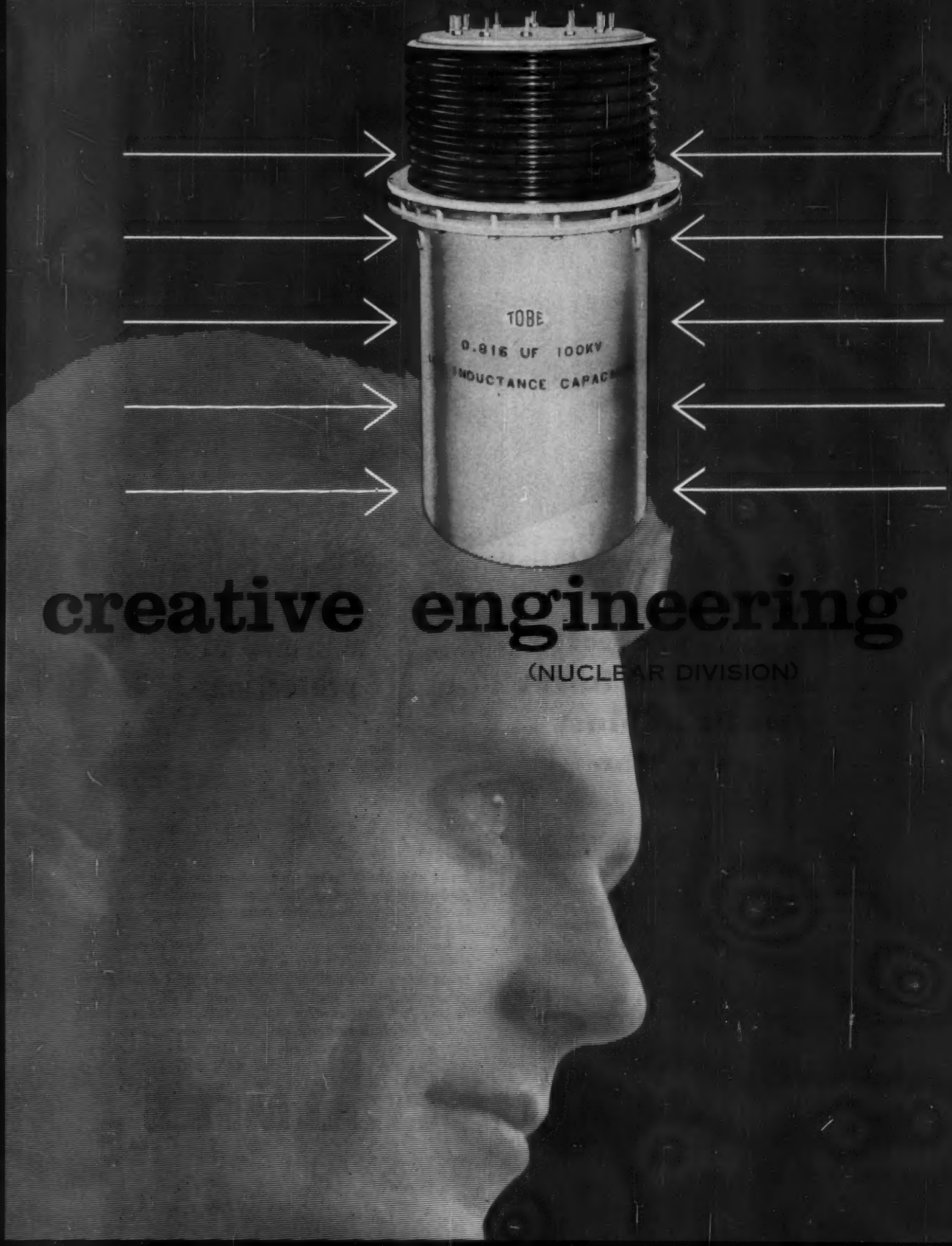
The overall surface treatment given an Allis-Chalmers network transformer is outstanding in itself. After grit-blasting and steam cleaning, tanks are given three coats of phenolic paint. Each coat is specially formulated to resist moisture . . . flowed on to assure complete coverage . . . baked on for permanency.

An extra measure of surface protection is just one of the many reasons why Allis-Chalmers transformers rate high with utilities and consultants everywhere. Get all the facts. Call your nearby A-C district office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

A-5609

ALLIS-CHALMERS

Expressly Designed for
University of California
Los Alamos Scientific Laboratory
Los Alamos, New Mexico



creative engineering

(NUCLEAR DIVISION)

Tobe NRG-200 Series Energy-Storage Capacitor

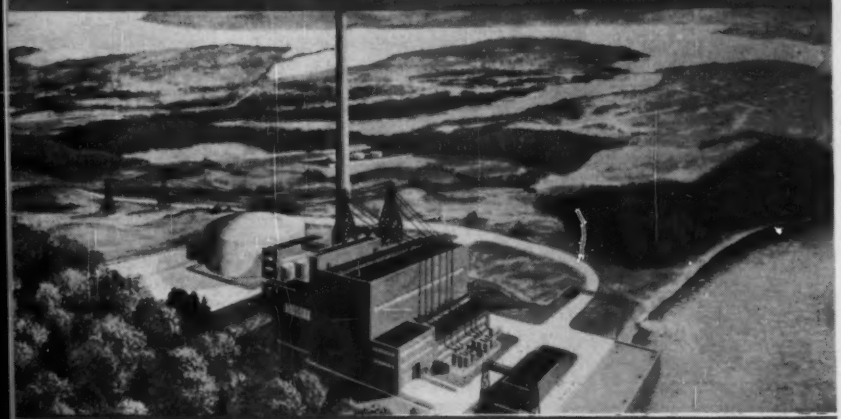
BUILDING CAPACITORS that can develop a peak surge of 20,000 megawatts takes intimate knowledge of capacitor physics and capacitor manufacture. Security regulations prevent our detailing the many projects in which Tobe is pioneering in the exciting area of thermonuclear energy-storage capacitors. Utility research engineers are now investigating the thermonuclear "pinch" technique as a possible source for continuous electric power.

Tobe 50 KVAR Power Capacitor

It was Tobe's long experience in building power capacitors that made it possible for us to develop capacitors capable of handling unprecedented peak loads. So, whether you need a bank of 50 KVAR's—or a bank of thermonuclear energy storage capacitors—talk to Tobe.

Tobe Deutschmann Corporation, Norwood, Massachusetts

in action



THE "FUTURE" IS HERE—in this artist's rendering of the Indian Point, N. Y. nuclear power plant now being erected on the Hudson River 40 miles north of New York, by Consolidated Edison.

TOBE TEMPALL CAPACITORS

Since 1913 persistent research, trustworthy engineering, rigid production standards.

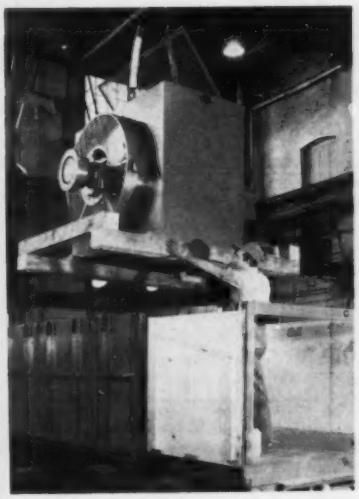
Westinghouse Reports

(*Continued from page* 102)

was recently put into operation by Westinghouse near Youngwood, Pa. The plant, which reflects the company's decision to enter the field of semiconductor devices for power and communication applications, will produce both germanium and silicon devices.

• A practical generator, utilizing the Hall effect, has been built by Westinghouse scientists. Essentially it is a solid state multiplying device that provides a voltage output proportional to the product of two electrical quantities: The current passing through it and the magnetic field perpendicular to it. This suggests its use as an analog computor, for example, to multiply directly two electrical quantities. One of these quantities is expressed as a current and the other as a magnetic field.

• A $10,000 patent award for inventions that greatly improved protection devices for electrical distribution systems has gone to two Westinghouse engineers, Robert C. Dickinson and Russell E. Frink. The award recognizes advancements which are included in eight patents dealing with devices that quench electric arcs in air circuit breakers.



Magnetic Drive Shipments Are Started to SCG&E

The first of six air-cooled magnetic drives are pictured being shipped by the Electric Machinery Mfg Co, Minneapolis, Minn., to the

(*Continued on page* 106)

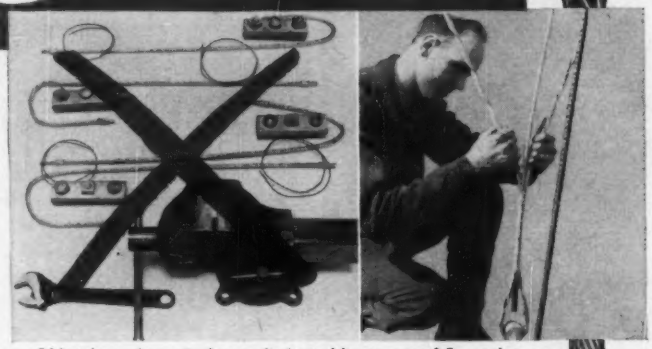
49% $AVINGS

on materials alone with

Fine Fanner Superformed

FANNGRIPS

FOR DEAD-ENDING GUY STRANDS



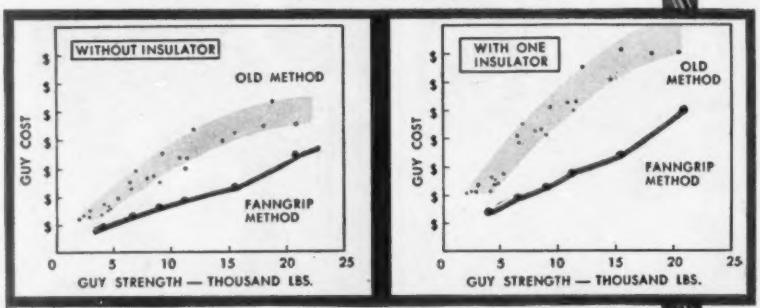
Old style costly methods are eliminated by the use of Fanngrips.

Now . . . costs compiled from typical guying methods using Fanner Fanngrips in comparison to other types of gripping devices show savings up to 49% *in materials alone* . . . in addition to the tremendous savings in time and labor!

Now . . . when savings are so important . . . here is more reason than ever to take advantage of the many Fanngrip features offered by no other type of gripping device:

- Provide maximum strand strengths.
- Eliminate laborious field fabrication.
- Self-clamping, permanently tight.
- Heavy coatings protect from corrosion.
- Do not damage guy strand surfaces.
- Dangerous and wasteful strand ends eliminated.
- Available in "B" or "C" coated galvanized steel, or copperweld.

Ask for cost-saving data today!



Two of a series of graphs demonstrating the savings available through Fanngrips over ordinary gripping methods.

Licensed for use under patent Nos. 2,275,019 and 2,587,521

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Magnetic Drive Shipments

(*Continued from page* 105)

new Silas C. McMeekin plant of South Carolina Gas & Electric Co.

Each drive is rated 2,500 hp at 1,800 rpm. The magnetic drives are direct coupled to a gear box which steps up the boiler feed pump speed to 5,000 rpm. They will provide precise speed control for the pumps. The drives, which require no supplemental cooling, will be part of the major power expansion now underway at SCG&E.

Polyethylene, Carbon Black Combined for Insulation

A polyethylene-carbon black plastic composition with improved properties is expected to be commercially available soon, according to a joint announcement of Hercules Powder Co, Wilmington, Del, and Godfrey L. Cabot, Inc, Boston, Mass.

This is a joint development program on the chemical cross-linking of polyethylene and carbon black compounds. It is expected to provide an economical, efficient material for insulating and jacketing wire and cable. Advantages of this plastic are said to include substantially improved strength, improved resistance to heat, and greatly reduced environmental stress cracking.

DuPont Combines Carbon, Fluorine for High Voltage

Du Pont Co, Wilmington, Del., reports that octafluorocyclobutane, a gas composed of carbon and fluorine, may soon make possible more reliable, lighter weight, electrical equipment capable of handling higher voltages.

In uniform electric fields, octafluorocyclobutane shows about the same dielectric strength as sulfur hexafluoride at very close electrode spacings, while at wider spacings it will sustain 20 to 30% higher voltages than sulfur hexafluoride.

In nonuniform fields, the new product sustains 30 to 50% higher voltages than sulfur hexafluoride. Although no data has been developed as yet for corona starting voltages for octafluorocyclobutane, Du

Pont said related data indicate the gas will have corona voltages four to six times higher than air, with the higher ratios in the more non-uniform fields.

Memphis Receiving 161-Kv 15-Million Kva Breakers

Memphis (Tenn.) Light, Gas & Water Division has received 12 of 31 power circuit breakers for protection of its new 812.5-mw steam generating plant and transmission system. They are component parts of a $2.5 million order recently awarded to the General Electric Co. Rated for 161-kv service, the breakers will interrupt short circuits ranging up to 15-million kva.

Fourteen of the breakers are for the Thomas H. Allen Electric Generating station, and 17 breakers—161 kv, 10-million kva—will be distributed among three major substations in different sections of the city.

MANUFACTURERS BRIEFS

Rome Cable Corp, Rome, N. Y., is adding $8,000 worth of new equipment at its main plant, to enable it to pierce, shape and finish diamond dies. The new set-up makes it possible for the company to continuously make "custom-made" diamond dies to the exact needs of its requirements for wire production. .

Brown Boverie Corp, New York, was awarded a $1,000,120 contract by New York State Power Authority to furnish four transformers and spare parts for the Tuscarora power plant of the Niagara Power Project. Each transformer will be 3-phase and have a capacity of 100 mva. Brown Boverie's bid was the lowest of six received by the Authority.

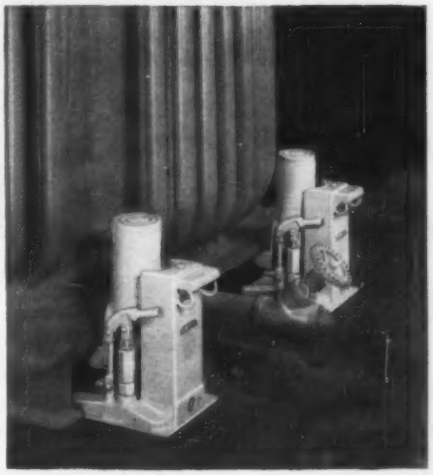
Army Corps of Engineers, Nashville, Tenn, will take bids for furnishing four 58,000-hp adjustable-blade propeller-type hydraulic turbines for the Barkley project power plant on the Cumberland River near Grand Rapids, Ky. The opening date of the bids will be announced when invitations to bid are issued.

Registers Give Lowest Cost Demand Metering!

This mechanical register gives meter men accurate demand metering at a lower cost than any other type of demand device. Ask your G-E salesman. He'll show you why.

GENERAL ELECTRIC (628-6)

Unique Transformer Jack Lifts Full Capacity on Toe or Cap



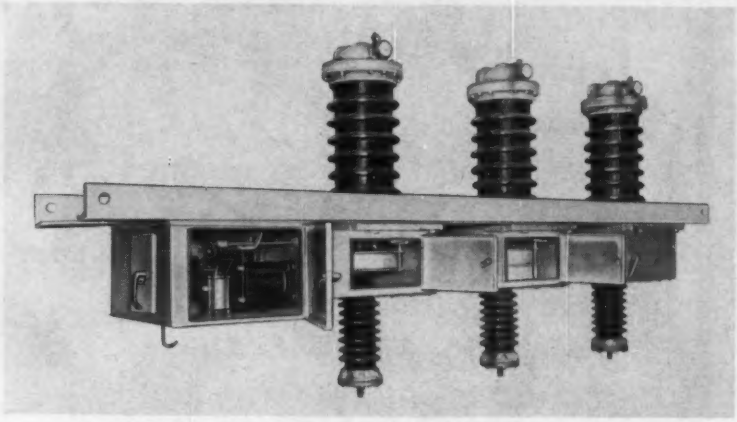
Exclusive design accounts for the success of this series of jacks. The roller bearing in the toe transmits eccentric toe loading to the flat milled surface on the stationary ram. This completely eliminates scoring action which is inherent in conventional toe lift hydraulic jacks. Lifts full capacity on both the toe or the cap.

Double pumps provide both speed and power. A safety by-pass prevents overloading. Ideal for lifting heavy machinery and transformers with minimum jacking clearances. Can also be used horizontally. Write for catalog.

Jack No.	Capacity Tons	Weight Lb.	Closed Height Inches	Travel Inches	Toe	Base: Forked Design
TJ-10	10	54	11¾	6	Min. Ht. 1¾" Width 3"	9½"x8"
TJ-25	25	110	14	7	Min. Ht. 2½" Width 4½"	9"x12"
TJ-50	50	230	18	10	Min. Ht. 3½" Width 5½"	11½"x14¼"

TEMPLETON, KENLY & CO., 2515 Gardner Road, Broadview, Illinois

New Equipment

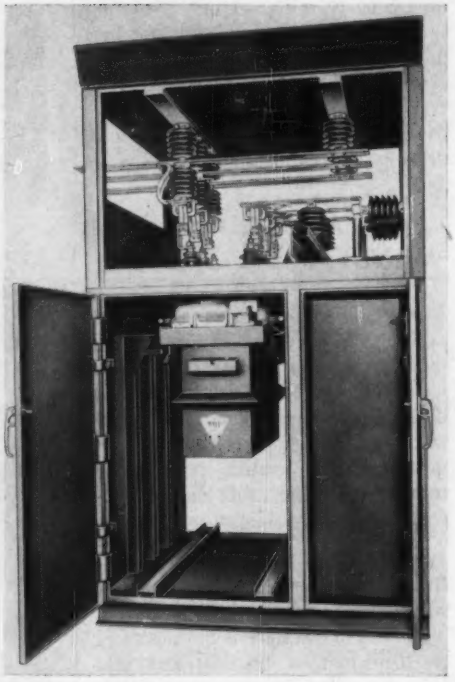


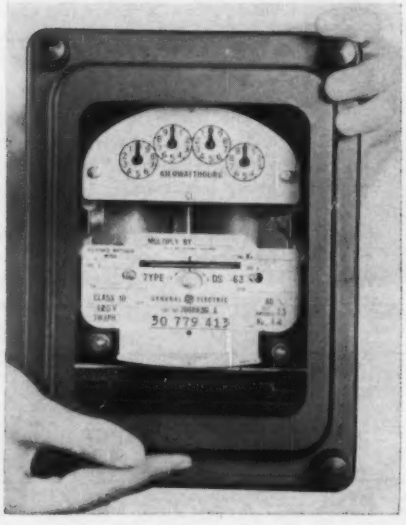
46-KV Gas Breaker

. . . filled with sulfur-hexachloride has 250-Mva interrupting capacity. Multiple reclosing duty cycle comprises three trips and two reclosures, with lockout after third trip. Interrupting time is better than specified 8-cycle rating. Unit is adapted to economical use in isolated or unattended installations. Contact interrupter assembly is easily accessible and may be removed from any one-pole unit as complete subassembly. Gas pressure is 60 psig. **Westinghouse Electric Corp, P.O. Box 2099, Pittsburgh 30, Pa.**

Recloser Switchgear . . .

. . . for 2.4 to 15-kv circuits is metal enclosed. Bus continuous current ratings are 800, 1,200, and 2,000 amp. Impulse level is 110 kv. Recloser continuous load ratings range from 25 through 560 amp. Interrupting capabilities up to 8,000 rms amp at 14.4 kv are available. Over most of recloser operating range, fault current is interrupted in 2.5 cycles or less. Feeder units include oil circuit recloser, bus conductors, cable terminating pothead, and optional devices such as current transformers, metering equipment, and 3-phase grounding switch. Auxiliary unit houses current and potential transformers, station auxiliary power transformers, load-break disconnect switch, and lighting arrester.
Line Material Industries, Milwaukee 1, Wis.





Polyphase W-H Meters . . .

. . . are 40% smaller and 28% lighter than predecessors. Designed for switchboard mounting and 60-cps service, DS-60 line had magnetically suspended rotor. Meters are 2.5 amp class 10 type. Thermal limit is 11 amp sustained load with flat load/speed performance curve. Basic types are DS-63, 3-wire, 3-phase; DS-65, 4-wire, 3-phase wye; and DS-66, 4-wire, 3-phase delta. Units with demand registers and watt-hr demand measurement are also available.
General Electric Co, Schenectady 5, N. Y.

(*More New Equipment on page* 112)

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that last and last...

FARGO

"5000 Series" CONNECTORS

Fargo connectors also make a connection that last and last.

The "vise type" design gives a high clamping force on the conductors with a minimum of distortion. The interlocking action of the pieces and the natural resilience of the metal provides permanently tight, low resistance joints.

The "V" grooves of the "5000 Series" design assure perfect full surface alignment between both conductors. The grooves provide a certain amount of self cleaning for both the conductors and connections as the conductors are pressed down into the "Vs."

The use of high strength, corrosive resistant Everdur castings and Duronze bolts assures permanence even under severest conditions.

Fargo "5000 Series" connectors are durable, dependable, and make connections that last and last.

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FARGO

"We cut Electrical Installation Costs and got better protection

. . . by installing Fusetron Fuses throughout our New Dairy Plant!"

William J. Oyala
ELECTRICAL SUPERVISOR
Fred Meyer Co. Portland, Oregon

Mr. Oyala continues . . .

"In our new dairy plant in Portland, Fusetron dual-element fuses saved us about $800 by enabling us to use the proper switch sizes for the motor disconnects. This was possible because the long time-lag of Fusetron fuses permitted us to install them in smaller sizes than would have been possible with ordinary fuses.

"In addition, we were able to reduce the space required by the control centers.

"The Fusetron fuses were installed in sizes small enough to give us motor-running protection as well as motor branch circuit protection.

"The result of this has been the prevention of motor burnouts. Not once in the past year of operation has a Fusetron fuse failed to protect a motor. We have 138 motors, ranging from 1/40 H.P. to 100 H.P., and all are protected by Fusetron fuses.

"Both Mr. Eric Christenson, whose company contracted the electrical work, and myself believe that by installing Fusetron fuses throughout our entire plant we got top protection at a cost lower than could have been obtained by any other method."

FUSETRON DUAL-ELEMENT FUSES PROVIDE SAFER, MORE DEPENDABLE PROTECTION

Only Fusetron fuses provide 10 point protection—not possible with any other type of protective device.

Thus, wherever a Fusetron fuse is installed you have safety as sure and dependable as you can buy—no matter what you pay.

AND FUSETRON FUSES REMAIN SAFE THROUGH THE YEARS . . . NO MAINTENANCE COSTS

Once properly installed Fusetron fuses are maintenance free. They require no costly inspection or downtime for calibration and other maintenance necessary on mechanically operated devices.

Dust, fumes, corrosion or age cannot prevent a Fusetron fuse from opening safely. There are no hinges, pivots or contacts to stick or slow down the operation of the fuse on short-circuit.

NO RECALIBRATION COSTS

When a Fusetron dual-element fuse does blow, there is no recalibration needed. As quickly as the fault in the circuit is corrected, you slip in a new fuse. The new Fusetron fuse is just as it came from the factory—accurately calibrated—and ready to give the same safe, dependable, coordinated protection as did the one it replaced.

FOR LOADS ABOVE 600 AMPS.—USE BUSS Hi-Cap FUSES to coordinate with FUSETRON Fuses.

On 600 volts or less, BUSS Hi-Cap fuses have an interrupting capacity sufficient to handle any fault current regardless of system growth.

They can be coordinated with Fusetron fuses on feeder and branch circuits to limit fault outage to circuits of origin.

Write for bulletin HCS.

For more information on FUSETRON dual-element Fuses . . . Write for bulletin FIS.

BUSSMANN MFG. DIVISION *McGraw-Edison Co.*
University at Jefferson, St. Louis 7, Mo.

458

Play Safe! Install Fusetron dual-element fuses and BUSS Hi-Cap Fuses throughout entire Electrical System!

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Shawmut "t-d" Renewables have the best time delay characteristics of any renewable fuse. The t-d link gives maximum time delay protection in the higher current ranges as well as in the overload zone. Short-circuit operation is instantaneous, along with a reduction in the rate of rise of recovery voltage. The t-d link notches blow one after the other with rheostat-like action.

HIGH QUALITY - LOW COST

Precision-made. No soldered, welded or steel parts. Simple, sturdy, dependable. Easy to install, take apart or renew. Interchangeable links, renewable parts. Large silver-plated contacts. Adequate 2-way venting.

COMPLETELY RENEWABLE FUSE OR LINK

Complete fuses and/or renewal links are available for either 250 or 600 V circuits; in ferrule ratings, from 0-60 Amps.; in knife-blade ratings, from 70 to 600 Amps.

Order now or ask for t-d Bulletin 500

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. . . have hydraulic lines run along either side of the derrick leg as an optional feature in Series 6800 and 3700. Arrangement keeps lines out of mud and out of way. Digger can be stowed without disconnecting hydraulic lines.

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Wound Rotor Motors . . .

. . . with up to 59% size reduction and 49% weight reduction are offered in ratings of 5 through 150 hp in two types. Tri-Clad 55 Type MR, intermittent rated for crane and hoist operation, comes in either totally enclosed non-ventilated or drip-proof enclosure. It is intended for uses requiring varying speed and high starting torque. Type M, rated for constant or adjustable speed, is available in open drip-proof enclosures for industrial pumps, compressors, and fans. Both types have Class B insulation, redesigned collector assembly, and improved secondary characteristics.

General Electric Co, Schenectady 5, N. Y.

Sleeve Bearing Motors . . .

. . . in ratings from ¾ to 15 hp are available for operation on all standard voltages from 208 to 550 v ac, polyphase. Bearing design uses fluid fiber material combined with oil to form fluid mass that is extruded into bearing cavity. Design prolongs oil retention and promotes longer bearing life. Totally protected insulation has coil heads and connections guarded against rough handling and abrasion. Motors may be mounted horizontally on wall, floor, ceiling or supporting deck.

Reliance Electric & Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio

Electrical Trolley System . . .

. . . for heavy-duty cranes and similar equipment is safe and requires little maintenance. Intended for installations from 110 to 600 v, it has

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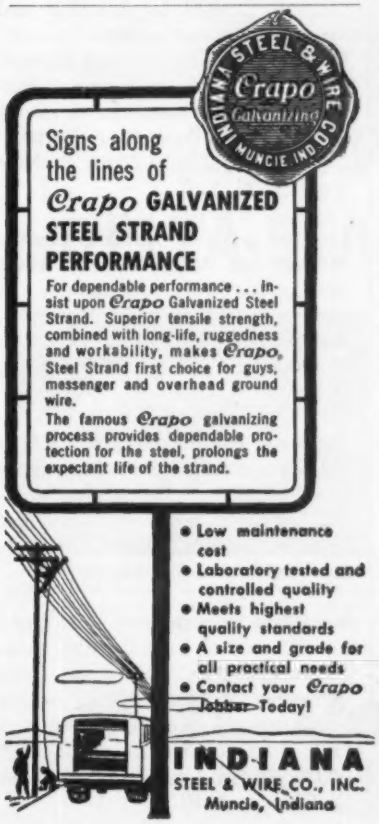
More New Products

Complete **steam gauge assembly** requires only two field welds to the drum connections. Locking type shutoff valves, provided in series with the gauge valves, are available to 21 and 27-in. center-to-center of boiler connections in both integral tie bar and support tube construction. Available for operating pressures above 900 psi.—Diamond Power Specialty Corp, Lancaster, Ohio.

(*More New Products on page* 114)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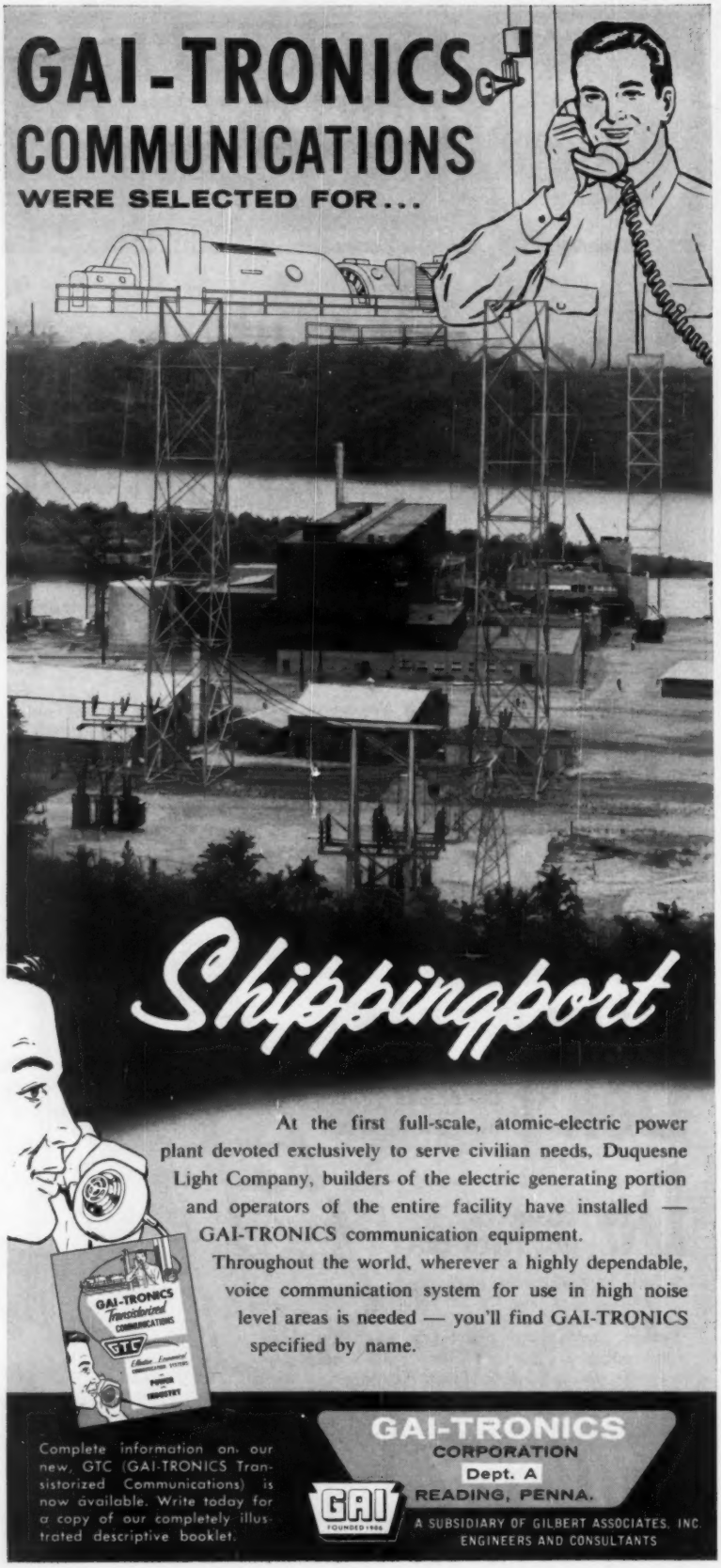
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At the first full-scale, atomic-electric power plant devoted exclusively to serve civilian needs, Duquesne Light Company, builders of the electric generating portion and operators of the entire facility have installed — GAI-TRONICS communication equipment.
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Automatic **alarm and control system** for reactor, utility, or industrial use transmits data from remote locations to a central station over wire or radio for visual and aural presentation. The Monitron scans all alarm or data points in a network at a rate of 200 to 20 millisec.—Moore Associates, Inc, 2628 Spring St, Redwood City, Calif.

Ultrasonic cleaner takes stators, rotors, and precision mechanisms up to 10″ in length. The Ultracleaner Model 500A features one dial tuning; one or two ultrasonic chambers may be used concurrently. —Lawrence Manufacturing Corp, Evans Terminal, N. Broad St, Hillside, N. J.

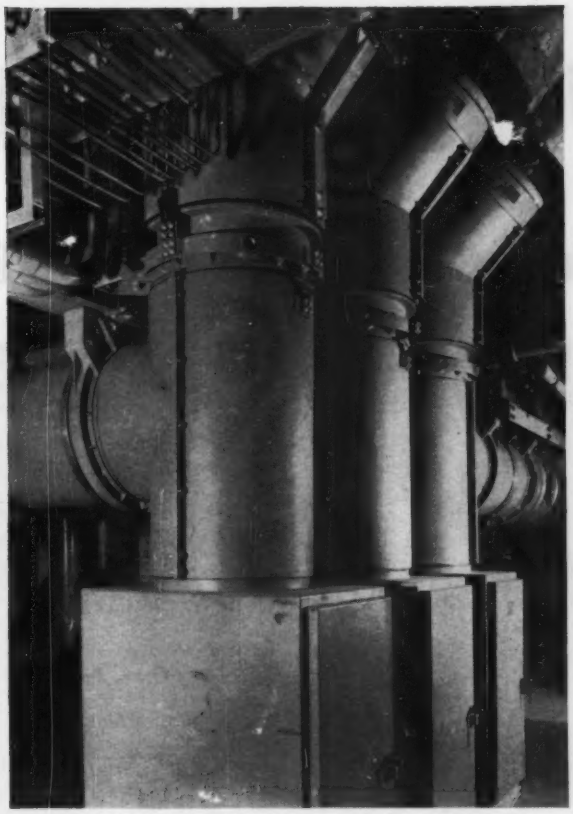
Pickup truck **tool box** permits all standard packing of small parts and equipment and is available in 75, 90 and 105-in. lengths. Full-length tool tray and materials tray with adjustable dividers are included.—Service Body Div, Morrison Steel Products, Inc, 601 Amherst St, Buffalo, N. Y.

Portable dry battery **search and floodlight** has bulb with the large filament focused for distance and the small filament for nearby work. Design permits easy battery replacement and speedy re-lamping. Battery gives 8 hours continuous service or 25 hours of floodlight.—Portable Light Co, Inc, 216 Williams St, New York 36, N. Y.

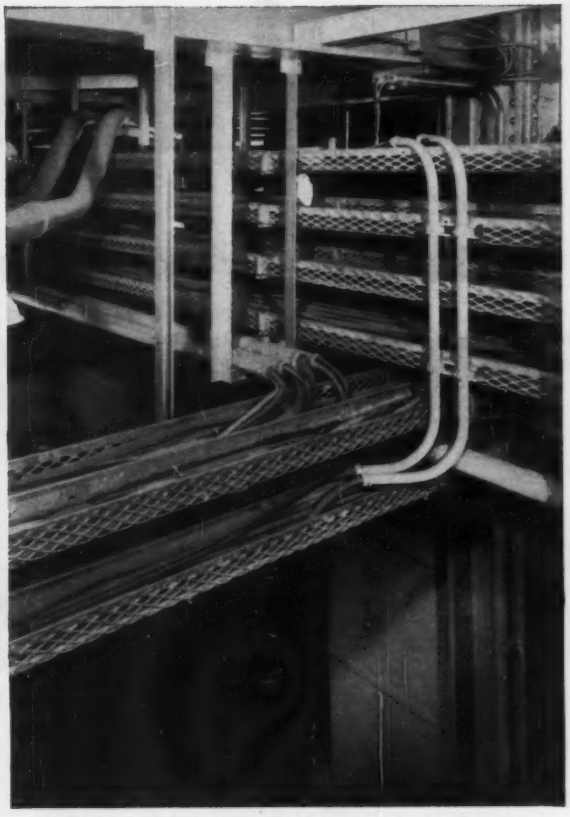
Flexible silicone rubber **heating blanket** has fast, efficient surface heating to 500F continuously. It combines features of ruggedness, durability, and lightness in weight.—Briscoe Mfg Co, 1055 Gibbard Ave, Columbus 3, Ohio.

Generator control panels for 500 to 800-kw a-c units hold voltage regulation to within 0.5% and are available in wall, floor and generator mounted designs.—Kato Engineering Co, Mankato, Minn.

Insulation stripping tool is designed for all types of control cable, flexible cords, PWC, telephone cable with vinyl or polyethylene jackets and bus drops. Tempered tool steel knife does not damage conductors. —The Buchen Co, 400 W. Madison St, Chicago 6, Ill.



FOR BOTH INDOOR AND OUTDOOR INSTALLATION, Delta-Star Isolated-Phase Buses are shipped pre-assembled. Specially-shaped neoprene gaskets keep out dust and moisture, permit liberal misalignment of ducts without reducing seal. No longitudinal gasketing needed.



STRONG, LIGHTWEIGHT EXPANDED METAL SECTIONS of this Delta-Star Uni-Tray Cableway System provide adequate ventilation, prevent collection of water and dirt. Exclusive "Wedgit" fittings connect sections quickly without bolts, pins, or hinges.

SHIPPINGPORT CHOOSES DELTA-STAR BUS AND CABLEWAYS

SHIPPINGPORT, the world's first full-scale atomic power plant designed exclusively for civilian needs, is supplying 60,000 Kilowatts to the heavy industrial area around Pittsburgh, Pa.

Only components of known quality could be designed into the world's first full-scale atomic power plant devoted exclusively to peacetime needs. Duquesne Light Company engineers demanded and got the very best of materials for all generation and transmission equipment at the Shippingport plant.

The choice of Delta-Star Isolated-Phase Buses and Uni-Tray Cableway Systems at Shippingport is proof of Duquesne Light's desire for top quality throughout the installation. Maintenance and inspection are made easy, installation is swift and economical with these two Delta-Star products.

COMPLETE INFORMATION about Delta-Star Isolated-Phase Buses and Uni-Tray Cableway Systems is available in these two illustrated catalogs. Ask your nearest Delta-Star representative for Bulletin 5006-B (Isolated-Phase Bus) or Publication 68 (Uni-Tray Cableways), or write Dept. 104, Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois. District offices in principal cities.

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Honeywell's experience

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Honeywell engineering can meet all your requirements in nuclear instrumentation from the blue print stage to full power.

Research engineers, applications engineers and systems engineers are thoroughly experienced in every phase of today's rapid progress in harnessing the atom for industrial development. Honeywell experience extends from the design and construction of components through complete control systems, and actual installation and startup.

Honeywell manufactures a complete line of nuclear amplifiers, recorders, and other units for monitoring reactor performance, consistent with the precision and safety demanded in reactor operations. In addition, this complete line of instruments also includes equipment for the measurement of temperatures, pressures, flows, and levels associated with steam generation and utilization.

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These Honeywell console and panel instruments keep control at the operator's fingertips in a major nuclear installation.

From this location, centralized control of load and frequency is accomplished economically.

A Honeywell load and frequency control system can automatically dispatch your nuclear powered generation economically. Proved in use at some of the country's leading power stations, Honeywell instrumentation provides centralized, efficient, highly flexible control.

Combine Honeywell load-frequency and reactor control systems for a completely integrated system. That's the logical approach to economical power distribution. Some of the outstanding advantages are:

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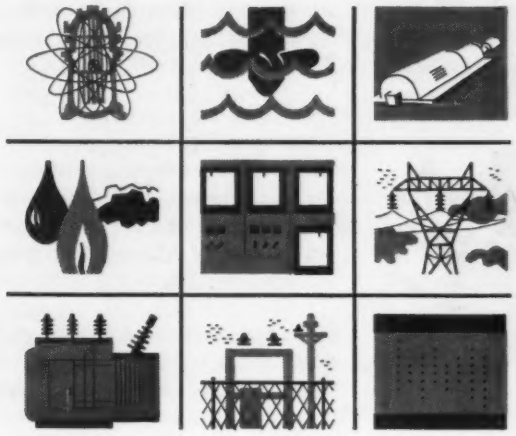
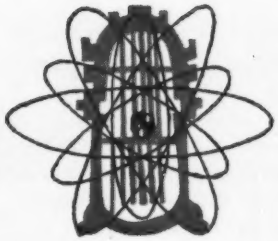


Report on
The American Power Conference

Electric utility management got the latest word on engineering progress last month. Scene was the American Power Conference in Chicago. For three days utility men who attended heard detailed reports on today's accomplishments and authoritative estimates of what's ahead. Here are some highlights:

The U. S. has little to gain in a race to produce the most nuclear energy, said Edison Electric Institute's Pres J. W. McAfee, but this certainly does not mean we should neglect reactor development, he added. Pointing out that today no reactor is as economical as a conventional power plant, McAfee urged that we pursue research to try to develop better reactors. Our goal, he said, should be to build enough of each reactor type to test its potentials fully.



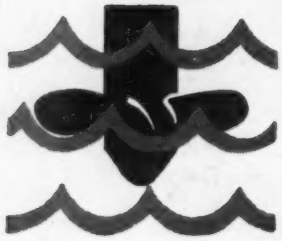
From Shippingport came good news of performance during system disturbances. Duquesne Light Co Chairman Philip Fleger said operating experience indicated a reactor plant requires less attention during disturbances than a coal-fired boiler. Shippingport unit was once dropped from 44 Mw to no load in a few seconds. Reactor fluid temperature rose only 10F, and pressure went up slightly, but there was no relief valve operation.

During three weeks of duty as firm capacity, Fleger said, Shippingport followed the normal load cycle and was started and stopped 16 times. Performance was very good. It followed load changes without movement of the control rods.

Reactor for the Enrico Fermi Plant will be on site in April, Detroit Edison Co VP Arthur S. Griswold reported. It will be assembled before the end of 1958, and will run as a test facility for one year with only one of its three sodium loops in place. It will not then be radioactive. Nuclear operation is scheduled for 1960, and it will be up to full load a year later.

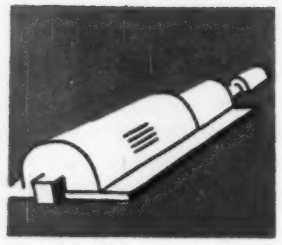
A pictorial progress report on Dresden Nuclear Power station was presented by R. D. Maxson, vp, and Joe Poer of Commonwealth Edison Co. Completion is scheduled on or before Dec. 8, 1960. High flow rate condensate demineralizers for Dresden are being built on the basis of pilot plant tests at Commonwealth Edison's Joliet Station, others reported. Under the test, the demineralizers treated 16 million gallons of water in 54 days (at 69 gpm per sq ft of bed area). Total iron and copper in the treated water stayed below five parts per billion—well below the 600-part-per-billion limit on solid content set for Dresden.

Pacific Gas & Electric Co expects competitive nuclear power from a 50-Mw plant to be built at Humboldt Bay, Cal., 200 mi north of San Francisco. C. C. Welchel, chief mechanical engineer, said estimated plant cost is $20 million. The first core will add $3 million and will produce a guaranteed 10,000 MWD per ton of uranium. With operation and maintenance expected to cost the same as for a conventional plant, PG&E estimates power costs as 8 mills per kwhr (at 90% capacity factor). Guaranteed capacity of the unit is 50 Mw, but 60-Mw output is anticipated.



Growing recognition of pumped storage hydro as a route to economical power was evident in one session of the conference. George R. Rich of Chas T. Main, Inc, cited the two-way pump-turbine as perhaps the largest single contributor to modernization and improved economy in tidewater-power designs, and pointed out the special advantages of pumped storage in a project like Niagara, where treaties control flow and natural storage facilities abound.

Plans are afoot for a joint pumped storage project that would develop hydro power for New Jersey Power & Light Co and supply water for Jersey City, said Ed. S. Loane of General Public Utilities Corp. Water supply will have top priority, he said, but studies justify 40 Mw of pumped storage by 1965. Sites are available with heads up to 1,000 ft. Development cost is estimated at $125 to $150 per kw, and value of pumped storage capacity is put at $165 per kw.



Philo 6, first supercritical pressure unit, yielded its first annual report at one session of the conference. Three papers presented experience gained during the first fruitful year of operation. (EW, March 31, 1958, p 41.) American Gas & Electric Pres Philip Sporn explained the unit's 120-Mw size was chosen because it was the smallest that would give necessary data for future larger units. A 450-Mw supercritical unit is now under construction.

More turbine design news came from E. P. Hansen, of Allis-Chalmers Mfg Co. Swelling of balance pistons at the 1,000F reheat inlet of the intermediate pressure turbine has been corrected by modifying diaphragm and seals to admit cooler steam. This lowers temperatures to 800-900F, and stops creep.

Adopt standards for supercritical boilers and piping now, urged William F. Crawford, pres of Edward Valves, Inc. By adopting them today, he said, engineering and tooling costs can be spread over many more units.

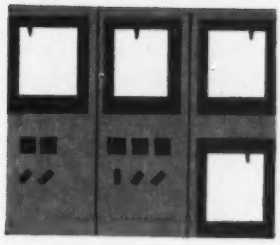
The case for multi-fuel firing came from Riley Stoker Corp's C. V. Hawley. With fuel economics changing rapidly, he said, many companies that have depended on one fuel are now swinging to multi-fuel. The turbo furnace, with burners working as opposed pairs, is particularly suited to multi-fuel firing, he said.

Our oil and gas reserves may be larger than previously supposed, Harlan W. Nelson of Battelle Memorial Institute told the Fuel Session; but coal still comprises the bulk of our future fossil fuel. Although coal reserves have been revised downward, Nelson predicted that large amounts of coal will be available at reasonable prices for many years. He cited estimates by McGraw-Hill's Coal Age magazine of 152 billion tons of mineable coal at present prices.

Coal travels cheaper than kwhrs for distances greater than 250-300 mi said Ebasco Services' S. B. Smith. For shorter distances it is usually cheaper to transmit energy by wire, but transmission beyond 250-300 mi cannot be justified except for mine-mouth plants. High-load-factor loading brings transmission into closer competition with coal hauling where large blocks of power are to be moved, he said, but rail competition and financing cost of lines determine the balancing

economies. Ebasco's conclusion: Power companies will rely on coal fired steam stations for some time to come.

Four large power pools told how they handle economy interchange.



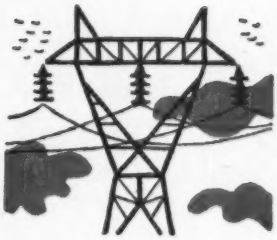
Pennsylvania-New Jersey-Maryland interconnection (a 9,100-Mw single-area pool with five members) allocates load changes as if it were one company, wrote its manager, the late H. W. Phillips. Capacity and generation are dispatched from a central point to maintain frequency. Interchange is on an economy basis; all flow is scheduled. Savings are allocated by taking the suppliers' cost against the weighted average value of all receiving companies.

The multiple-area Northeastern interconnection (New England, New York, parts of Ontario and Michigan) has contracts for sharing savings under these rules: Lowest incremental energy cost at point of delivery is assigned market with highest decremental value; minimum saving to each party must be 0.3 mill per kwhr; if power flows through another company's system to the receiver, savings are split equally among producer, transmitter, and receiver; and, purchasing company must have enough spinning capacity to replace economy purchases.

On the American G&E System, the pool coordinator schedules economy interchange with foreign systems only when a differential cost of 0.3 mill per kwhr exists. Cost data is provided by an incremental-fuel-cost slide rule and a transmission penalty-factor computer. Savings in "out of pocket" costs are shared equally.

The United Power Pool (parts of Illinois, Iowa, Missouri, and Kansas) has no contracted interchange between members. All interchange is between companies, with deliveries or receipts considered as sales or purchases. There is no inadvertent interchange. The pool dispatcher initiates an economy transfer only when 0.5 mill per kwhr differences in incremental cost are indicated.

Interest in the Extra High Voltage Session focussed on two interconnections—a 345-kw line in the U. S. and a 400-kv system in Germany.

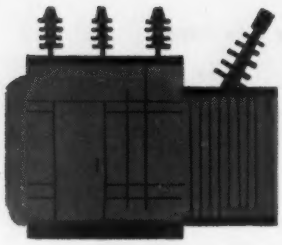


The Commonwealth Edison—AG&E 345-kv hook-up to be completed this spring will link two systems totalling 7,000 Mw load and permit a 200-Mw cut in generating reserve for each. The 92-mi double-circuit line has 1,000 ft between towers. Length of line, size of conductors (1,414 MCM ACSR), and lack of suitable power source ruled out sleet-melting, so conductor separation provides sleet-proof construction as well as reducing danger of flashover from galloping conductors. A 38-deg phase-shifting transformer rated 100 Mw thermal will apportion energy flow between the 345-kv line and a parallel 138-kv tie.

First 214 miles of a German 400-kv system reinforcing a 220-kv network has been carrying 600 Mw since October. Maximum operating voltage of 420 kv was based on IEC agreement. Actual voltage varies from 360-420 kv. Transformers at terminals of the two-circuit delta-configuration tower line are 660-Mva 3-phase banks of 220-Mva units with an 18% tap range. Cost of line: $90,000 per mile. Three "langstab" (long stick) insulators per string were used.

H. P. Sinclair, of AG&E, ascribed Europe's 400-kv to present IEC standards which render 345-kv superfluous. In the U. S., use of 345-kv was influenced by abundance of 138-kv, he said. The next step here will probably be 460-kv rather than 400 kv, since many companies are now using 230 kv, he predicted.

Barring further inflation, TVA expects to reduce its transmission investment slowly from today's $42.50 per kw to about $35, Merrill DeMerit and K. E. Hapgood said. However, consideration being given use of extra high voltage transmission, on the order of 440 kv, might prevent this reduction, they said.

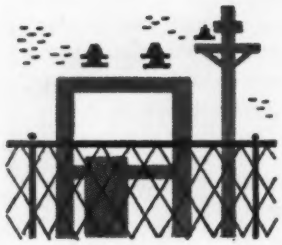


U. S. Bureau of Reclamation's 45 years of experience with power transformers was summarized by C. L. Rose. Some results: Use of 3-phase units unless weight and handling problems are prohibitive; use of autotransformers for power transformation between grounded neutral systems where line-to-line voltage ratio is 3:1 or less; economical protection of power transformers with fuses, fault interrupters, or high-speed automatic grounding switches.

F. J. Vogel, of A-C, saw little risk from switching surges of three times normal line-to-neutral voltage for power transformers with reduced BIL—even if arresters have been lost or omitted. Since external parts of transformer bushings are subject to moisture and dirt, Vogel saw some justification for using bushings with external characteristics reduced only one step in some cases.

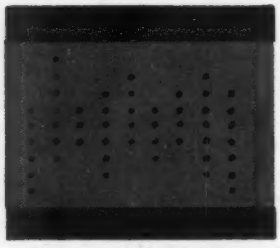
Philadelphia Electric Co has saved $30 million since the mid-1930's by applying increased normal and emergency ratings to transformers 1,000 kva and up. Calculations assume 5% loss of life for each emergency—and assume one emergency in ten years.

Use of dual-voltage distribution transformers, developed to make voltage cutovers on distribution feeders fast and easy, were discussed by R. D. Nelson, RT&E Corp. Design involves a primary winding in even multiples (e.g. 2,400x 7,200). An external switch changes from lower to higher voltage by changing windings from parallel to series connection.



Reclosers and vacuum switches were prominent in the distribution session. Reclosers are finding favor in urban and suburban substations, said Line Material's Frank W. McStay, as their ratings, flexibility, clearing time, and economy improve. Power Class II and III metal-enclosed recloser units, just offered, can save 17-50% on price of metal-clad switchgear and cut volume 25-30%, he said.

Vacuum interrupters can de-energize high-voltage transformers more cheaply than oil switches, said J. W. Rittenhouse of Hi-Voltage Equipment Co. A new device that momentarily grounds the neutral of an ungrounded capacitor bank reduces switching equipment costs 20% when combined with selective sequential phase opening by means of vacuum switches.



Digital computers have much to offer for solving utility system problems. Here's why AG&E prefers a digital computer over a network analyzer for system load flow studies: A 60-75% reduction in study cost; ability to interrupt study without a cost penalty; filing of complete data on tape or cards permits supplementary studies later; reduction of engineering time and effort; automatic tabulation of results; and automatic determination of all system losses.

Bonneville's J. R. Curtin liked digital computers for evaluating future plans because of accuracy, easy data handling, and economy on a large load flow basis. The network analyzer is superior for studies where successive cases depend on analysis of previous ones, he said, and is still used for load flow studies.

Cleveland Electric Illuminating Co used an IBM 650 for steam turbine tests on Eastlake No. 4—with accurate results and savings in time and cash. Costs: $13,600, of which $3,000 was chargeable to calculation.

Tests on AG&E's Philo No. 6 were made with Datak, an automatic digital data collecting system consisting of analog scanners and a control console. The scanners convert primary element signals into a standardized analog signal that is converted to a code punched in paper tape which contains the cycle and test identification data. Datak data is then transmitted to a remote IBM 650 digital computer for processing.

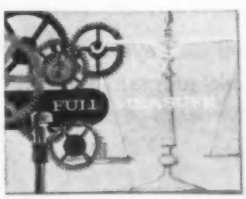
Have you considered all meter investment costs?

R. A. Warren, Sales Manager
Watthour Meter Department
Westinghouse Electric Corporation

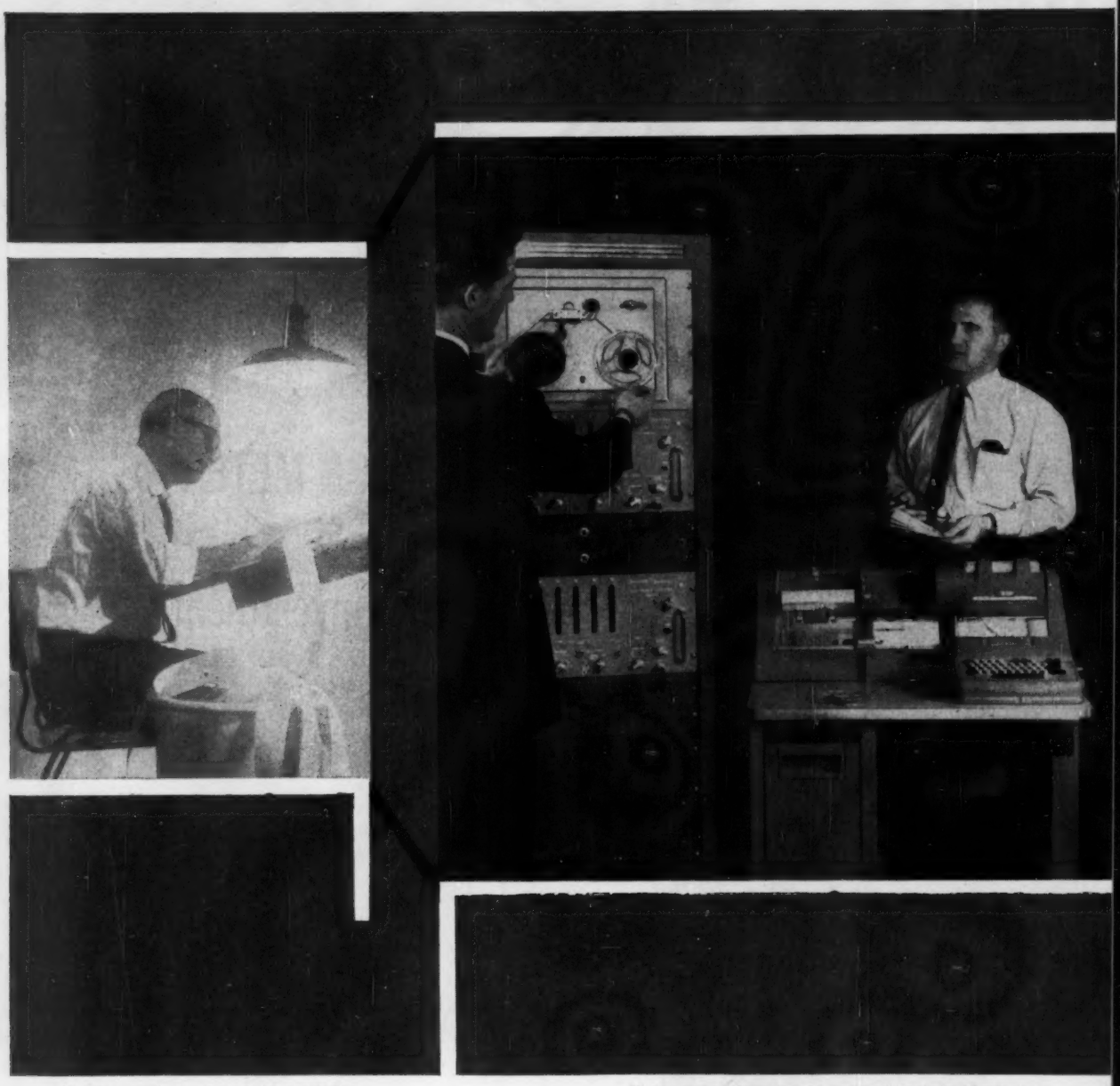
It's easy to think of the purchase price as the major cost of the watthour meters on your system. But, to assure "Full Measure" for your dollar, it's important to consider those corollary costs, which over the lifetime of the meter often exceed its first cost. For instance, we've found that *repairs* and *meter change-outs* can detract considerably from what you first took to be a "bargain."

Loss of registration and replacements are major costs of metering. When loads grow, conventional meters are overloaded. Although adequate at their rated capacity, old 5-ampere meters are outdated and should be replaced.

Modern research at Westinghouse has developed single-phase watthour meters that promise to eliminate these secondary costs forever. The Class 200 meter, which Westinghouse pioneered, provides extended straight-line accuracy and capacity to handle any load of the future without loss of registration . . . or need for replacement. J-40509



Has your Westinghouse representative shown you how to get "Full Measure" for your meter dollar? Ask him for a copy of the informative new presentation, B-7208.



End the drudgery of chart interpretation

32-day record from tape to punched cards in 35 minutes

Twelve-Month System Load Survey completed

Here is your greatest single opportunity to improve the system load curve of your utility! Load surveys will give you the information to shape your sales promotion policies . . . enabling you to build loads for optimum utilization of your generating capacity.

Now, the first time, load surveys can be a routine, economically feasible program for your system. No need to tie up hundreds of man-hours in interpreting, recording, calculating and checking data from recording instruments. End the time-consuming task of getting the consumer's approval and expensive wiring at each location.

With the new Westinghouse Load Survey Meter, you simply select your sample, remove the regular meter, plug in the load survey recorder, replace the watthour meter . . . and start recording. Come back in a month. Remove the recorder,

FULL MEASURE FROM WESTINGHOUSE METER RESEARCH

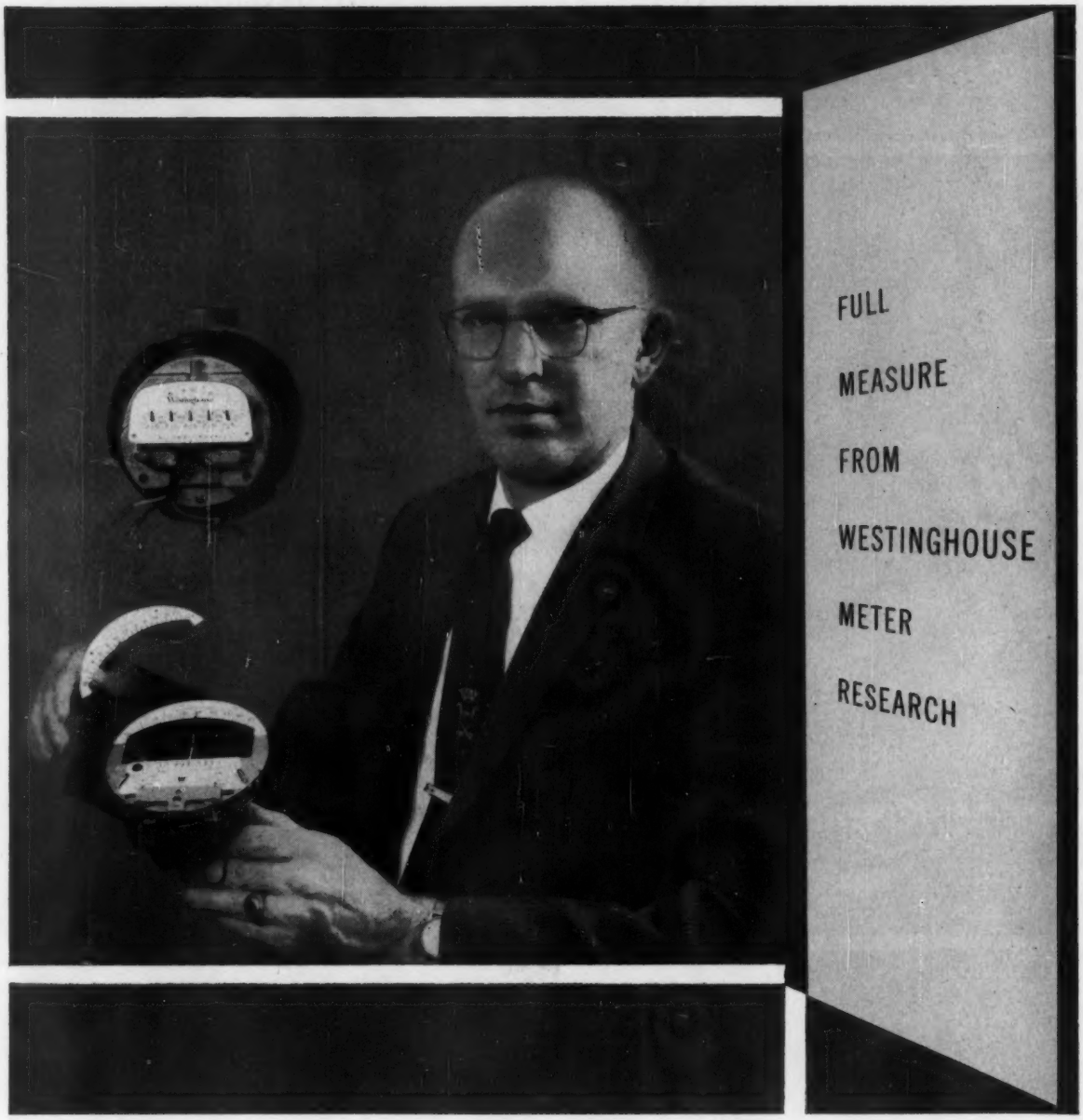
in two days!

and your job at the home is finished without once disturbing the homeowner. Then run the magnetic tape through a translator to produce a set of punched cards . . . and you're ready for machine computation and printing . . . at high speeds and all automatically!

The 600-foot tape will record demand for 32 days, unattended. It can be set for 15-, 30- or 60-minute intervals . . . with a maximum rate of 240 demand impulses for a 15-minute interval.

Call your Westinghouse sales engineer today for information that can mean improved operating efficiencies for your company. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-40516

YOU CAN BE SURE...IF IT'S Westinghouse



DEMAND METERING WAS NEVER EASIER . . .

with the new Westinghouse dual-range thermal element

The new Westinghouse design makes demand metering with either Class 100 or Class 200 meters simpler than ever before. With a single Westinghouse dual-range thermal element, you can register demand in the range "0 to 12 kw or 0 to 24 kw" with Class 100 meter . . . either "0 to 24 kw or 0 to 48 kw" with a Class 200 meter.

Thermal element can be rewired in seconds, without removing it from the meter. Positive indication from the front of correlation between element and scale.

Rod Adams, engineering section manager, demonstrates that demand unit can be removed by loosening five screws. This compact unit provides smallest thermal meter available . . . with minimum projection.

The basic simplicity of this meter (both kw and kva types available) makes it easier to install, easier to stock and far easier to service.

New product designs are another result of the Westinghouse policy of Plowback of Earnings into research . . . giving you "Full Measure" for your metering dollar.

For complete details about the new Westinghouse thermal demand meter, call your Westinghouse sales engineer. Or, write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-40512

YOU CAN BE SURE... IF IT'S Westinghouse

Used to dry veneer on table tops and doors . . .

Oven Trims Process Time 95%

JACK A. HARRIS, Sales Engineer, Texas Electric Service Co, Fort Worth, Texas

Drying time for glueing veneer to doors and table tops has been cut 95% as a result of an electric drying oven recently installed at the Gaby and Company plant in Fort Worth, Texas. The installation includes a 12-kw oven and a 2-hp vacuum pump. Measuring 10 ft x 5 ft x 3 in., the oven has nichrome wire both in the lid and in the bottom plate.

After the glue and veneer have been applied, the door or table top is placed in the oven. With the lid in place, the vacuum pump is started, building up a lid pressure of 5 lb per sq. in. over the surface of the veneer. The oven is on for a total of 10 minutes. After 15 minutes, the door or table top is removed with the glue completely dry. The previous process, using clamps and air drying, required six hours to do the same job.

Electric Power Cuts Pumping Station Overhead Costs

BRENT SHUNK, Industrial Sales Engineer, Pennsylvania Power & Light Co, Harrisburg, Pa.

Lower overhead costs and fast start-up in case of emergency are the results of conversion to electric power at a standby municipal water pumping station in Harrisburg, Pa. Now, instead of firing boilers to pump water, pushbutton controls start the motors as water is delivered from the filtration plant on the island.

Located on the Susquehanna River, the station has been used as a standby since 1948 when the city obtained another source of water. Using a total of 946 kw, the electrical installation replaces a battery of coal-fired boilers and two steam turbine driven pumps.

The new equipment consists of two 2300-v, squirrel cage induction motors with normal starting torque and low starting current. One motor, rated at 800 hp, 880 rpm, drives a 10,200-gpm centrifugal pump; the other rated at 1250 hp, 1180 rpm, drives a 10,500-gpm centrifugal pump. To meet variable head conditions, the two pumps can be operated individually or in series combination to deliver the rated 10,000-gpm flow against heads of 117.5, 235 and 355 ft.

Industrial TV Spurs Cable Insulation Process

An industrial TV system used to monitor a hydrapulping process in the Western Electric Co cable plant in Kearney, N. J. has speeded up production and provided a solution to space problems created by added pulp insulating machines and increased capacity pulping equipment. Two cameras, each focused on a 3,000-gal. hydrapulper tank, transmit a continuous picture of the process to a 14-inch TV monitor on the operator's control panel.

In addition to savings in time and manpower, the TV system makes it possible to check the location of nearby personnel when the automatic cycling is started, thus eliminating a possible safety hazard.

Because of their size, the tanks had to be installed in a location where the operator controlling the pulp conveyor that loads the vats could not see them. The extra pair of eyes provided by the TV does the job for him.

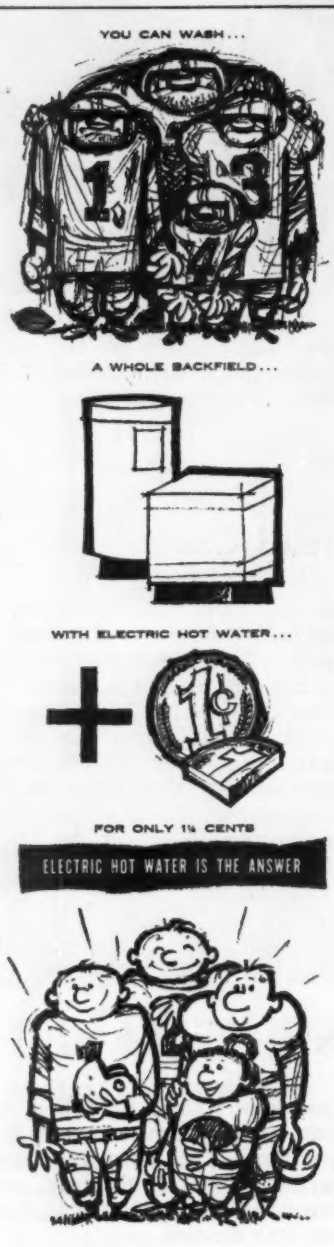
While watching the televised pictures, the single operator starts the hydrapulpers sharp 45-inch diam. rotor blades, which revolve at 197 rpm, turns on the water from pipes circling the top of the tank, and then dumps up to 1,100 lb of sheet pulp into the tank.

Pictures of either tank are obtained by simply switching the monitor's reception from one tank to the other. The two cameras and the control board monitor are connected by coaxial cable.

(*More Selling on page* 128)

KPL 'Draws' Attention to New 1¼¢ Rate

Kansas Power & Light uses cartoon ad series to build consumer interest and comment in its new water heating rate


YOU CAN WASH...
A WHOLE BACKFIELD...
WITH ELECTRIC HOT WATER...
FOR ONLY 1¼ CENTS
ELECTRIC HOT WATER IS THE ANSWER
It all adds up to this . . . a quick-recovery electric water heater, combined with KP&L's new low water-heating rate of 1¼¢ per kilowatt-hour, will provide you with scads of steaming hot water — safer . . . faster . . . and more economically than any other way. See your appliance dealer for an *electric* water heater.
THE KANSAS POWER AND LIGHT COMPANY

'YOU CAN WASH a whole backfield . . . ' is one cartoon caption in ad series KPL is using to plug its 1¼¢ rate

Kansas Power & Light Co is using the light approach to selling electric water heating. The Midwest utility has turned to eye-catching cartoons that tell the customer how much can be cleaned for so little.

The off-beat art work (see left) centers around the theme, "You can wash a —— with electric hot water for only 1¼¢." The 1¼¢, of course, stresses Kansas Power & Light's special promotion rate, and the strange (but happy!) assortment of odd bedfellows who can be washed so well and cheaply electrically run the gamut from basketball players to alligators. Examples:

- "You can wash a hippo, all over . . ."
- "You can wash a whole basketball team . . ."
- "You can wash one huge dog and a small girl . . ."
- "You can wash one large elephant and small boy . . ."
- "You can wash a jalopy and a teen-ager . . ."
- "You can wash a thrashing 'gator . . ."
- "You can wash an entire giraffe . . ."
- "You can wash a whole family of rabbits . . ."

". . . with electric hot water for only 1¼¢".

The ads run 1 col by 15 in. and 2 cols by 15 in., and are being inserted in some 140 daily and weekly newspapers in the KPL territory. In addition to the newspaper advertisements, the company's Topeka office has an animated window display of the "thrashing 'gator" theme.

Main idea behind the unusual cartoon series is to catch the reader's eye and create consumer comment on the utility's new lower rates through use of unusual situations.

How well has it worked?

It's too early to say, but a KPL spokesman, in a statement to Electrical World, said, "Results have not been tabulated as yet, but the great number of comments indicate considerable consumer interest."

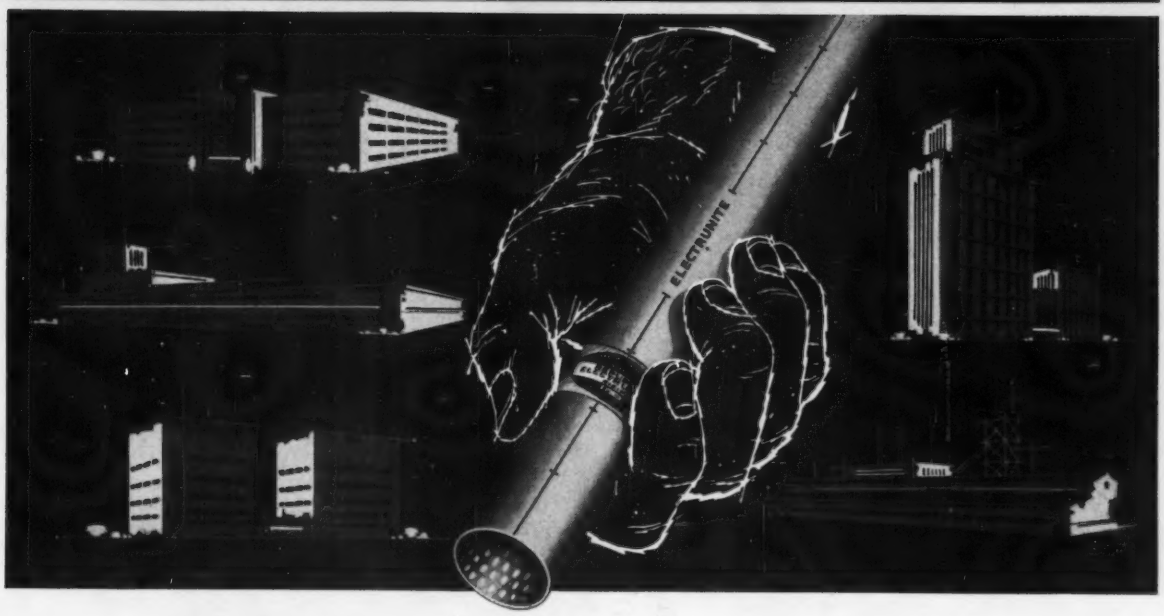
KPL's is the second such change in electric utility advertising in recent weeks. New York's Consolidated Edison Co has taken a somewhat similar approach to selling its electric services. One possible benefit of this kind of advertising is that it tends to dispel the deep-seated, sub-conscious customer suspicions that anything connected with electricity is (1) dangerous, and (2) too complicated. It helps accomplish this by associating electricity with situations that are commonplace, simple and light-hearted.

General Electric Holds Highway Lighting Institute

General Electric Co's Outdoor Lighting Department, Hendersonville, N. C., held its first Highway Lighting Institute recently.

The three-day sessions were aimed at familiarizing members of the U.S. Bureau of Public Roads and the various state highway departments with the problems and developments of modern highway lighting systems. The idea, according to GE, was to help the 79 attendees provide maximum nighttime safety on the new 41,000-mile federal highway network. They received indoctrination in basic highway lighting system design and application, and participated in workshop sessions devoted to the lighting of intersections, cloverleafs, tunnels, underpasses, bridges and viaducts.

THE BEST COSTS LESS INSTALLED



meet tomorrow's power demands today with Republic ELECTRUNITE

ELECTRICAL METALLIC TUBING

Building better communities—better schools, apartments, office buildings, shopping centers, commercial and industrial plants—demands ample-sized conduit that will meet tomorrow's load-building demands today. Republic ELECTRUNITE® E.M.T. offers economies that "protect now . . . and provide for the future".

Power producing utilities can meet the challenge and opportunity of future raceway capacity. By using and suggesting to their customers that Republic ELECTRUNITE E.M.T. offers economies, they can recommend adequate size raceways be installed, giving all the advantages of a pull-in, pull-out, grounded system.

The economy of installation, too, is a factor, since ELECTRUNITE E.M.T. is "INCH-MARKED"® in feet and inches on all popular sizes for quick, easy, accurate measuring. Full length "GUIDE-LINE" and Republic Bending Tool helps to keep bends in the correct plane—avoiding "wows", wasted time and material.

Another installation advantage is the exclusive "INSIDE-KNURLING" providing a ball-bearing like surface that makes wire pulling as much as 30% easier—provides electrical raceway flexibility to meet future load-building demands at no extra installation cost.

ELECTRUNITE E.M.T. is produced to A.S.A. Specification C80.3 and Federal Specification WW-T-806, latest revisions, and carries the Underwriters' Seal of Inspection. Complete wire protection in accordance with the National Electrical Code.

That's why utilities can safely recommend ELECTRUNITE E.M.T. to their customers and also consider Republic ELECTRUNITE E.M.T. for their own plant installation and expansion programs. The economies afforded using ELECTRUNITE E.M.T. may be applied to the purchase of additional load-building equipment and conveniences.

REPUBLIC STEEL
STEEL AND TUBES DIVISION

REPUBLIC STEEL

Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-5668
213 EAST 131st STREET • CLEVELAND 8, OHIO

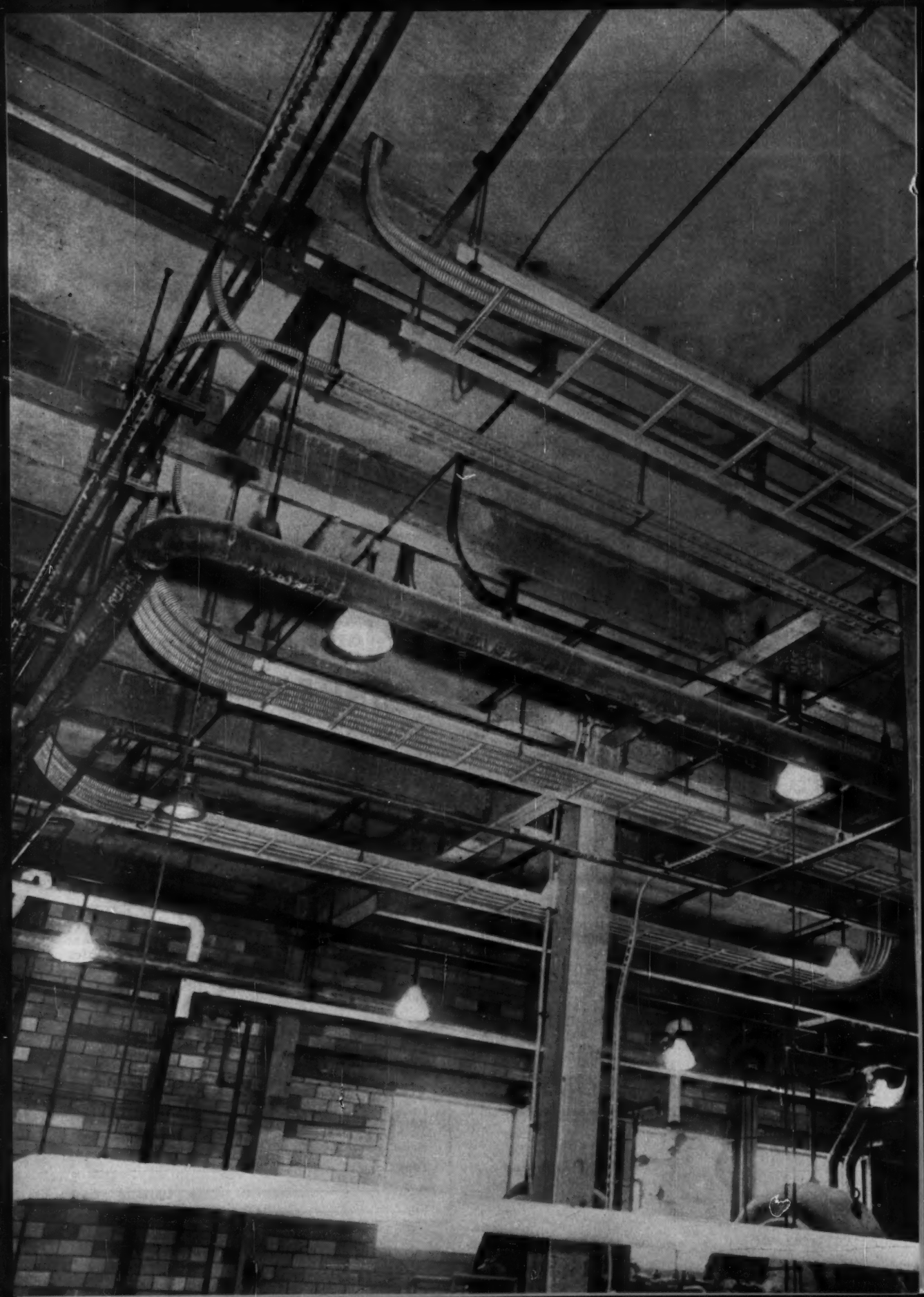
I want to learn more about Republic ELECTRUNITE E.M.T. Please send additional information.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____



this picture shows why . . .

Anaconda's Duralox Cable cuts installation costs for Electric Utilities

Duralox needs no conduit—saves time, money, man power . . . provides greater safety!

Duralox* is enclosed in its own durable, yet flexible metal armor. Thus, it can be installed *without* conduit—in long runs over and around obstructions, in racks, indoors or out. For one midwest utility this meant a savings of $5.00 per foot—over the cost of installing ordinary cable with rigid conduit!

Duralox is so flexible that additional flexible connections are not needed at motors. Duralox is easily moved—allowing for changes in design during construction or service, and facilitating repair work on other apparatus.

Because cables are always shielded, Duralox means greater safety.

And Duralox's lower reactance in higher voltages—from the close spacing of conductors—results in reduced voltage drop and more efficient power distribution. Anaconda Duralox Cable is available in all popular sizes and voltages—copper or aluminum conductors with paper, rubber, plastic or varnished-cloth insulation. Anaconda Duralox is also available for control circuits.

Why not talk to the Man from Anaconda about Duralox for your utility operation. See Anaconda in your telephone directory, in most principal cities.

FITTING NEATLY AROUND OBSTRUCTIONS. Anaconda Duralox Cable meant easy installation in utility's generating station.

BULLETIN DM5606 on Anaconda Duralox is yours for the asking. Write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. 58307

OUTSIDE RUNS of weather-resistant Duralox are supported by simple extensions of racks. Since Duralox can be used inside or out, number of joints is kept to a minimum.

LIVE BETTER ELECTRICALLY

SEE THE MAN FROM

ANACONDA®

FOR **DURALOX POWER & CONTROL CABLE**

Three Are Advanced to VP at Louisville G&E

Louisville Gas & Electric Co has announced the recent election of three company executives as vice president. They are A. G. Rosenbaum, A. J. Kieffer, and W. I. Lukenbill.

Rosenbaum, in his new capacity, retains the title of general superintendent of the operating department. He is a 35-year veteran at LG&E.

Kieffer, as vice president, remains assistant treasurer of the utility and relinquishes the title of assistant vice president.

Lukenbill, now VP, most recently served as assistant vice president and general auditor.

In simultaneous promotions, J. F. Mayrose was elected assistant vice president and remains assistant general superintendent-operating dept; Henry J. Anderson was elected controller; William B. Thurman, assistant vice president; and John Ong, assistant secretary.

A. G. ROSENBAUM A. J. KIEFFER W. I. LUKENBILL

J. S. BROWN, DUQUESNE C. E. CANNON, WWP G. S. HARRIS, BG&E J. D. WORTHINGTON, PG&E

Key Engineering Slots Filled by Four Utilities

Four utilities have made these appointments to key engineering posts:

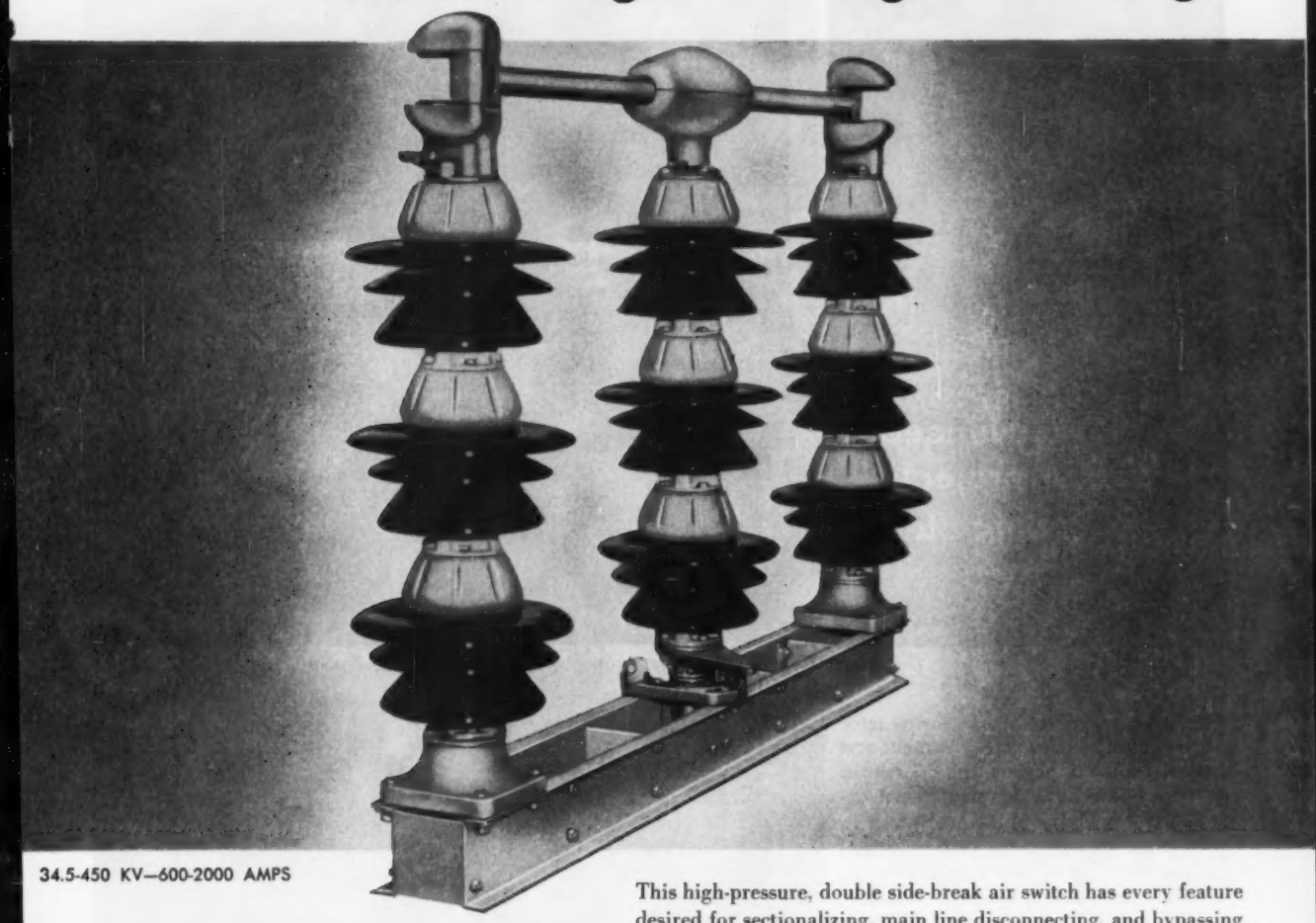
At Duquesne Light Co, J. Stanley Brown led five engineering promotions in the rearrangement of departments in the Engineering & Construction Division with his elevation to chief engineer of the division. Brown, former chief engineer-engineering dept, has also been engineer, electrical station engineer, and electrical engineer during his 21 years with the utility. In other promotions, Edwin M. Gue became system planning engineer, system planning dept; Alexander C. Stanojev, mechanical engineer, mechanical engineering dept; Samuel Rosenbach, electrical engineer, electrical engineering dept; F. J. Jernberg, structural design engineer, structural engineering dept.

At Washington Water Power Co, C. E. Cannon was named chief engineer to succeed Lester R. Gamble, retired. Cannon, chief electrical engineer since 1953, will now head WWP's 70-man engineering dept. A 28-year WWP veteran, he has administered the company's atomic study program since 1954.

At Baltimore Gas & Electric Co, George S. Harris succeeds retiring Lennox Birckhead as chief engineer, Electric Division. In this position he is responsible for the design of power generating stations, electric substations, and for system planning and preparation of the division's construction budget. He has been mechanical engineer since 1939.

At Pacific Gas & Electric Co, J. Dean Worthington is new chief civil engineer, succeeding Carl W. Appleford, retired. His promotion gives him responsibility for the structural and hydraulic design of hydroelectric, steam-electric, and other large construction projects and for engineering economic studies and planning for future projects.

Southern States' streamlined RDC offers 5 big advantages in design



34.5-450 KV—600-2000 AMPS

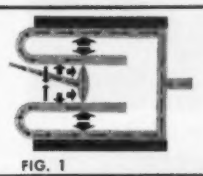


FIG. 1

CUTAWAY VIEW

Amplitact® Contacts on RDC

High pressure Amplitact contacts provide maximum dependability under high current short-circuit conditions. The arrows in Fig. 1 show direction and relative magnitude of electromagnetic forces induced when switch is subjected to fault current.

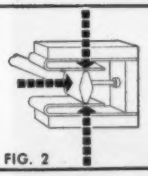


FIG. 2

The resultant ELECTRO-MAGNETIC forces, as shown by arrows in Fig. 2, greatly increase contact pressure and positively hold blade in engaged position.

This high-pressure, double side-break air switch has every feature desired for sectionalizing, main line disconnecting, and bypassing service in substations and on transmission lines. In addition the RDC has five outstanding advantages in its design:

1. Low silhouette in the open position permits application where vertical clearance prohibits the use of vertical-break switches.
2. Switch blade is completely dead in open position. Phase spacing is less than required for single side-break switches.
3. Horizontal breaking permits lower zone of protection against lightning, with corresponding savings in steel structures.
4. Smooth, corona-resistant contours result in RIV of less than 500 microvolts.
5. One-piece blade is balanced in all positions, reducing stress on moving parts. No blade balancing mechanism is required.

Your Southern States representative will be glad to give you complete details. Or write direct for Bulletin 57 RDC.

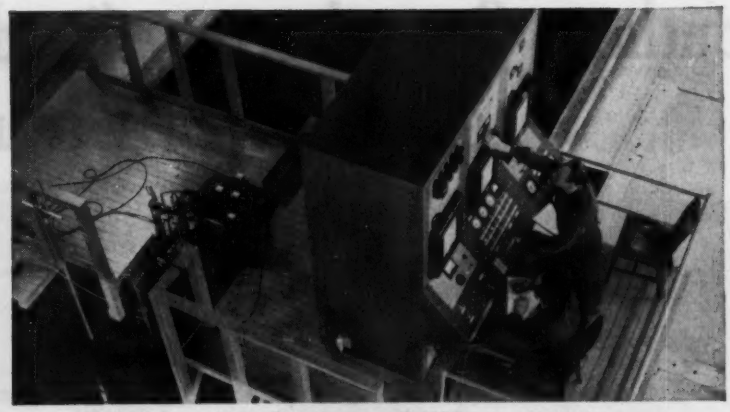
LIVE BETTER ELECTRICALLY

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

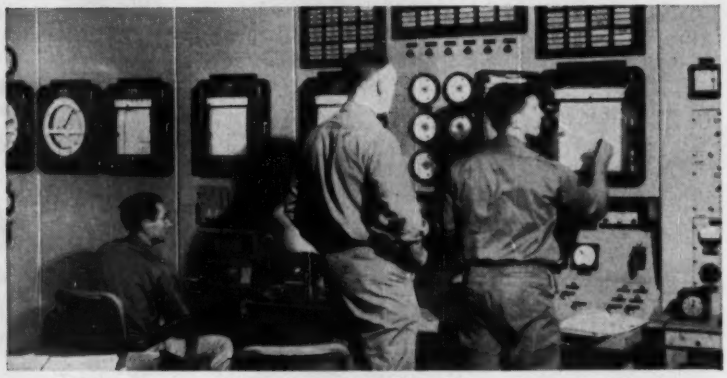
IN CANADA: Dominion Cutout Co., Ltd., Toronto

31

advanced
reactor projects
completed



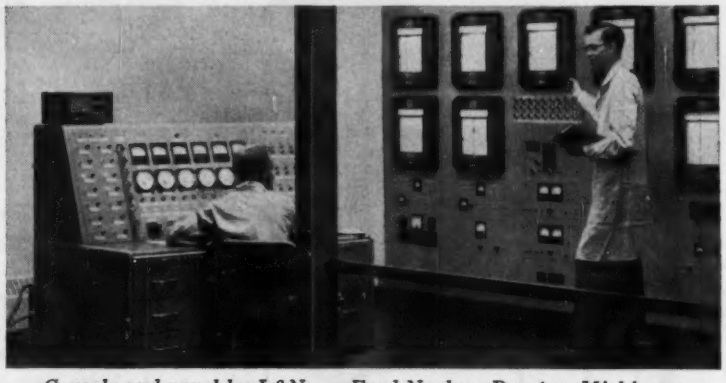
The Penn State Reactor uses L&N instrumentation.



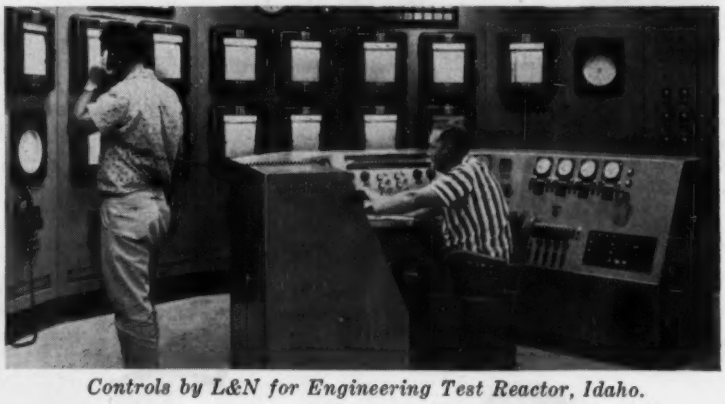
L&N controls on Experimental Boiling Water Reactor, Illinois.

If you're planning a nuclear reactor . . . you probably face measurement and control problems. Leeds and Northrup engineering teams offer unmatched experience for solving these problems . . . experience demonstrated in the designing and building of instrumentation for 31 advanced reactor projects throughout the world. In many cases L&N took responsibility for the design and construction of complete instrumentation systems.

The installations shown here represent only a few of the projects that have been completed, or are now being instrumented, by L&N engineering teams. They are ready to apply their experience to *your* reactor instrumentation program. For full details request Folder ND-46-70-700(1) from The Leeds and Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Penna.



Console and panel by L&N . . . Ford Nuclear Reactor, Michigan.



Controls by L&N for Engineering Test Reactor, Idaho.

LEEDS NORTHRUP
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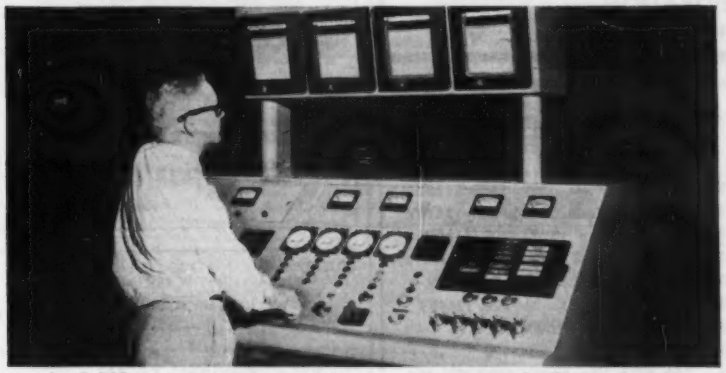
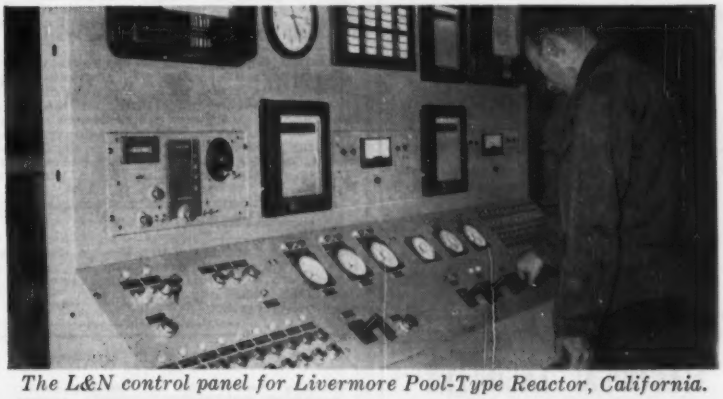
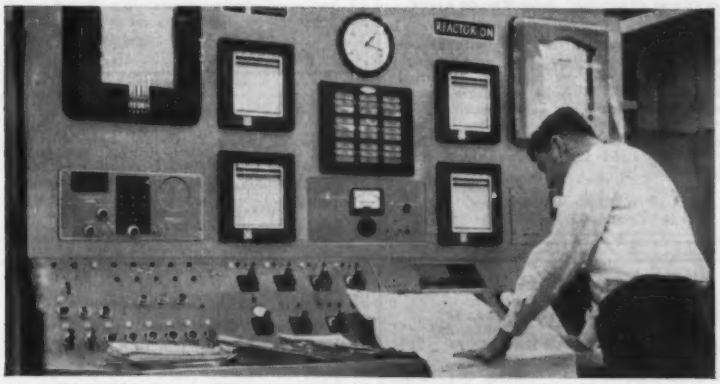
Checking L&N instruments for a reactor for Hamburg, Germany.



An L&N system regulates this research reactor in Pennsylvania.



The L&N control panel for Livermore Pool-Type Reactor, California.



The São Paulo Reactor, Brazil, will be under L&N control.

Liming Gets Sales Post

Charles A. Liming has joined Hubbard & Co as sales manager of its Electrical Apparatus Division. He will headquarter at the firm's new Electrical Research Lab at McCook, Ill.

Prior to joining Hubbard, Liming gained varied experience in the power switching and apparatus field, holding managerial, sales, and manufacturing positions.

Muncie Names Exec VP

Julius C. Strasbourger is new executive vice president of Muncie Engineering, Inc, and its affiliates, Lift-a-Loft Co and Mitchell Maintenance Co, Inc.

Strasbourger had been with Cleveland Electric Illuminating Co for many years, serving in the engineering, operations, and purchasing departments.

OBITUARY

Lewis B. Blalock, assistant vice president-industrial development for Texas Power & Light Co, died suddenly in a Dallas hospital.

Clarence E. Hartay, Duquesne Light Co's superintendent of operations, eastern district, transmission and distribution dept, died suddenly after a coronary attack.

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A subsidiary operating in Sicily (Italy) has a career position for a Pipeline/ Electrical Engineer, age limit to 40 years, with the following qualifications:

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Large electrical manufacturer of switchgear, unit sub-stations, transmission and distribution switching and protective equipment needs services of apparatus engineer for Atlanta, Georgia location. Duties initially will consist of contacting electrical utilities in six Southeastern states with our established field organization, specifically to do product line sales promotion work on high-level engineering basis. Man chosen will be graduate electrical engineer, 30-45 years of age, with successful engineering, operation or sales experience with class of equipment listed and with proper personality and temperament to do business in the South. Travel required 60-70 percent of the time, however home weekends. Substantial opportunity. Refresher training provided initially and periodically. Address replies to:

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3— 333 KVA Mol 33000-7200/12470Y
3— 333 KVA W-H 13800-240/480
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P-7752, Electrical World
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Established engineering firm with offices in Chicago and New York needs engineers experienced in directing electrical design groups. Must be graduate, registered, experienced in relay coordination, fault studies, switchgear specification and handling vendor and client contacts. Age 25-40. Required for Chicago office. Submit resume to

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2	1500	Penna.	69,000-4160/2400, 3 Ph.
3	1000	G.E.	66,000-2300/4000
3	667	Kuhl.	66,000-480
1	2000	West.	44,000-2400, 3 Ph.
3	200	West.	44,000-480
1	5000	West.	34,500-13750/6875, 3 Ph.
1	3750	G.E.	34,400-13800/7960, 3 Ph.
2	3000	Stand.	33,000-4160, 3 Ph.
2	1500	G.E.	34,400-2520, 3 Ph.
3	1000	A.C.	34,650/11,500-2300
4	833	West.	33,000-2300
3	200	A.C.	34,500-2400/7200/12470Y
1	3000	A.C.	23,380-2500/4330Y, 3 Ph.
3	2000	A.C.	26,400/13,200-2390/4140
3	1250	G.E.	26,400/13,200-2400/4150
2	1500	G.E.	23,000-2400/4000, 3 Ph.
3	100	G.E.	22,000-7200/12470Y
3	50	G.E.	22,000-2300
3	1667	G.E.	13,800-600
1	1000	G.E.	13,800-600, 3 Ph. Unit Sub.
1	600	Stand.	13,200-2300, 3 Ph.
1	450	Penna.	13,200-2400, 3 Ph. Askarel
3	333	Uptegraff	13,800-480
1	4500	West.	7200-2400, 3 Ph.
3	125	A.C.	4900-2300
3	100	G.E.	4800-120/240
3	1500	G.E.	2300/4000-460
3	150	West.	2400-230/115
3	100	G.E.	2300/4000-230/460

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1	250	A.C.	601 A. 2400 V. 3 Ph. STEP
3	96	G.E.	200/400 A. 2400 V. 1 Ph. IND.
8	36	West.	150/300 A. 2400 V. 1 Ph. IND.

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The Meetings Calendar

MAY

Pennsylvania Electric Association — Communications Committee, Mountain View Hotel, Greensburg, Pa., May 5-6; Electric Equipment Committee, Skytop Lodge, Skytop, Pa., May 8-9; Systems Planning Committee, Garden City Hotel, Garden City, Long Island, N. Y., May 12-13; Relay Committee, Hotel Cleveland, Cleveland, Ohio, May 15-16; Systems Operation Committee, Hotel Statler, Hartford, Conn., May 22-23.

Institute of Radio Engineers—National Symposium on Microwave Theory and Techniques, Stanford University, Stanford, Calif., May 5-7.

National Electrical Contractors Association — Districts Six, Eight, and Nine Annual Conference, Hotel Biltmore, Los Angeles, Calif., May 5-7.

Edison Electric Institute — Transportation Committee, Hotel Roosevelt, New York City, May 5-9; Commercial Cooking Conference, Chicago, Ill., May 6; Transmission & Distribution Committee, Hotel Biltmore, Los Angeles, Calif., May 8-9; Electrical Systems & Equipment Committee, Radisson Hotel, Minneapolis, Minn., May 12-13; Hydraulic Power Committee, Fresno Hacienda, Fresno, Calif., May 12-14.

American Public Power Association—Annual Meeting, Roosevelt Hotel, New Orleans, La., May 6-8.

• **Electric Companies Public Information Program**—Workshop Conference Committee, Penn-Sheraton Hotel, Pittsburgh, Pa., May 7.

• **Public Utilities Advertising Association** — Penn-Sheraton Hotel, Pittsburgh, Pa., May 8-9.

Illuminating Engineers Society—Intermountain Regional Conference, Hotel Whitman, Pueblo, Colo., May 8-9.

National Association of Purchasing Agents—Annual Convention, Chicago, May 11-14.

Interstate Power Club — Hotel Martinique, New York City, May 12.

American Institute of Electrical Engineers — East Central District Meeting, Frederick Hotel, Huntington, W. Va., May 13-15.

New Jersey Utilities Association—Spring Meeting, Seaview Country Club, Absecon, N. J., May 14-16.

Pacific Coast Electrical Association, Inc—Annual Convention, Hotel Del Coronado, Coronado, Calif., May 14-16.

Industrial Heating Equipment Association, Inc.—The Homestead, Hot Springs, Va., May 18-21.

Northwest Electric Light & Power Association — Business Development Section Conference, Great Falls, Montana, May 19-21.

American Welding Society — Spring Technical, National & Welding Show, Hotel Schroeder, Milwaukee, Wisc., May 19-23.

Instrument Society of America — Power Division, Henry Hudson Hotel, New York City, May 21-23.

American Right of Way Association—Electric Utility Section Meeting, Sheraton Palace Hotel, San Francisco, Calif., May 27; Fourth Annual National Seminar, Sheraton Palace Hotel, San Francisco, Calif., May 28-29.

Southeastern Electric Exchange — Industrial Power Sales Conference, Edgewater Gulf Hotel, Gulfport, Miss., May 29-30.

JUNE

National District Heating Association—49 Annual Meeting, French Lick-Sheraton Hotel, French Lick, Ind., June 2-5.

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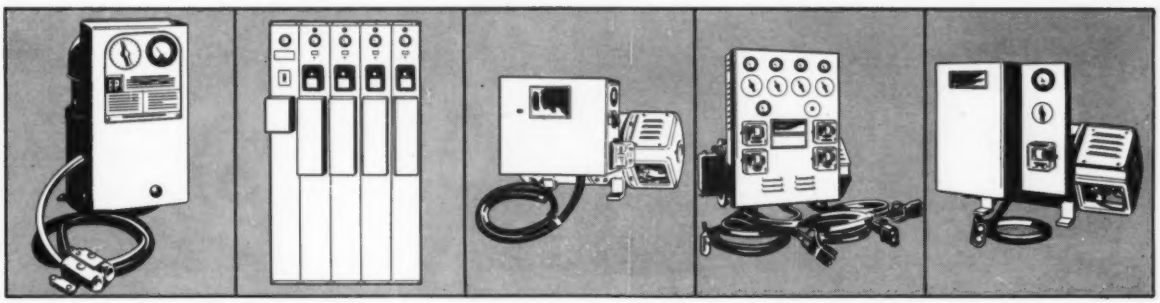
EXIDE TO MARKET ALL ELECTRIC PRODUCTS CO. CHARGERS



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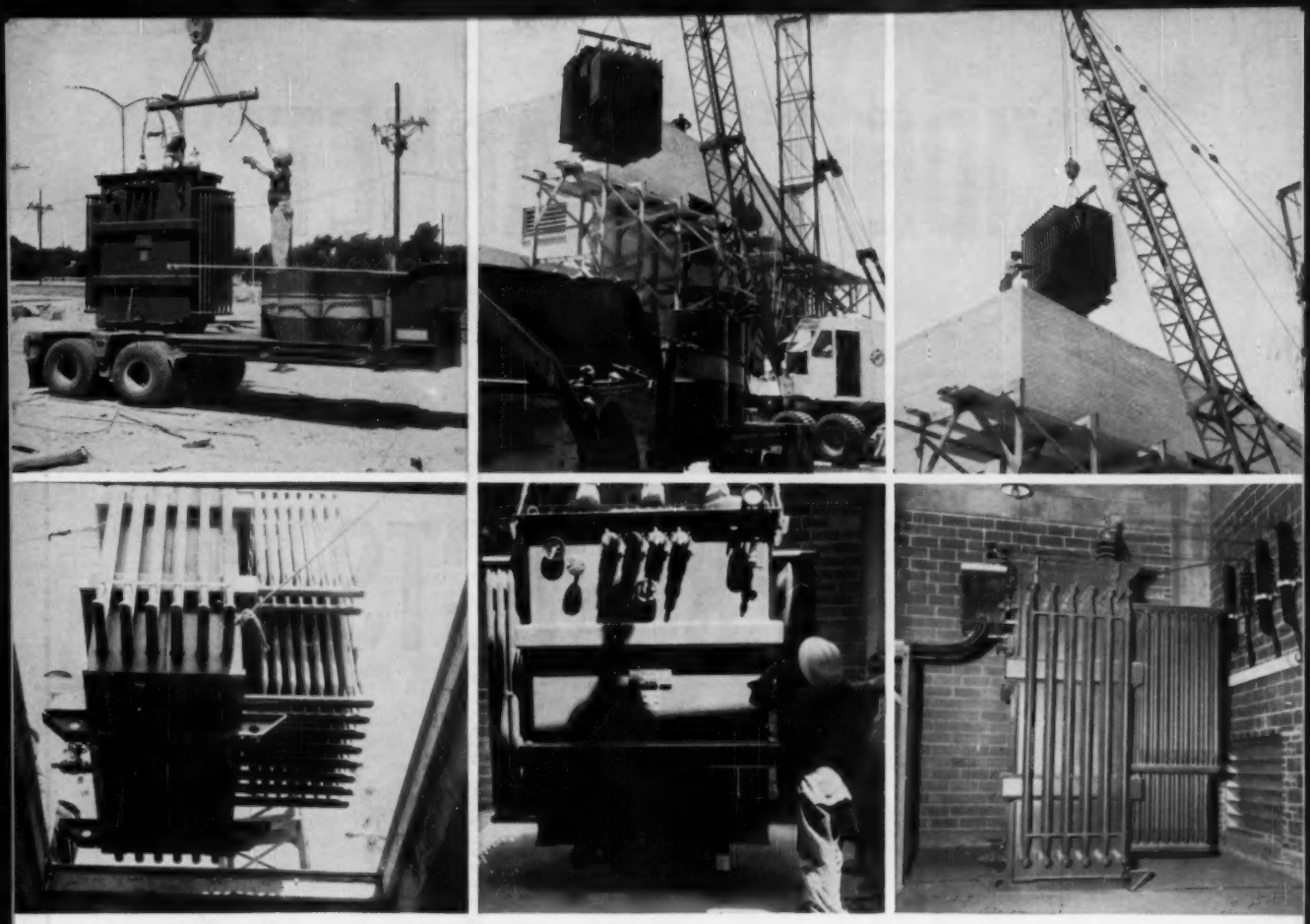
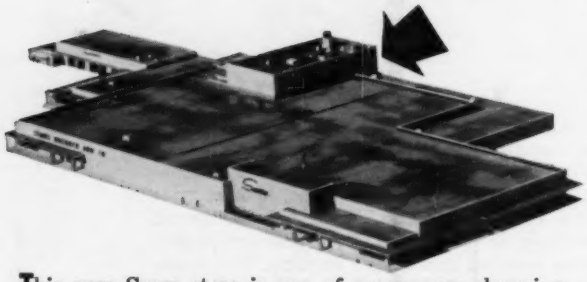


POWER ON THE ROOF INCREASES EFFICIENCY...

at Sears' new Amarillo shopping center



This new Sears store is one of many new shopping centers springing up in growing Amarillo, Texas. Following the modern trend, all floor space has been devoted to merchandise and display. Air-conditioning and operating equipment is installed on the roof—out of the way.

To put power where it was needed—on the roof to eliminate the losses and expense of long secondary copper runs—Southwestern Public Service Company selected Kuhlman. A regular user of Kuhlman, Southwestern knew from past experience that Kuhlman transformers would provide the required reliability. Then, too, like all Kuhlman customers, wherever they are located, Southwestern benefits from the close, friendly service of a nearby Kuhlman factory.

Whether it's distribution or power, for industrial, commercial, or residential use, you'll find Kuhlman transformers are designed to meet standard specifications as well as special conditions. Talk over your requirements with your Kuhlman representative. He lives in your area and knows your needs.

KUHLMAN POWER TRANSFORMERS

KUHLMAN ELECTRIC COMPANY General Offices: Birmingham, Michigan

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